

# AI4100

## Portable Reader

## User Manual

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**Softrail**  
**1098 Venetia Road**  
**Eighty-Four, PA 15330**

**Tel. 888 872-4612 (toll free US and Canada only)**

**Tel. 724 942-1473**

**Fax. 724 942-1480**

**E-mail [aei@signalcc.com](mailto:aei@signalcc.com)**

**Web Page [www.aeitag.com](http://www.aeitag.com)**

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# AI4100 Portable AEI Reader

## 1. BRIEF OVERVIEW

The AI4100 Portable AEI Reader is a small, lightweight unit consisting of a Janam XM2 rugged mobile computer running Windows Mobile 6.5, an integrated AEI tag RF reader, and a built-in 2-D imager for reading barcodes.

The AI4100 Portable AEI Reader can be used to verify AEI tag data, capture track consist by reading the AEI tags on rail vehicles, and record barcoded serial numbers from seals, products, or replacement parts.

Unlike previous portable AEI tag readers that have two separate components that must be Bluetooth paired with each other, the AI4100 is a single-piece unit (see Figure 1).



**Figure 1- AI4100 AEI Portable Reader**



## AI4100 Portable AEI Reader

The RF reader and antenna are permanently attached to the Janam XM2 mobile computer (see Figure 2).



**Figure 2 - AI4100 Side View**

The AI4100 AEI Portable Reader is shipped with a charging cradle, which allows for a USB connection to a computer, and a battery (see Figure 3).



**Figure 3 - AI4100 Components**



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Even though the portable reader can read over 10,000 AEI tag on a single battery charge, we recommend the purchase of a second battery for each portable reader. The cradle has a separate battery charging position in the back of the unit for charging a second battery while the portable reader is in the cradle and having its battery charged (see Figure 4).



**Figure 4 - AI4100 Portable Reader in the Cradle**

Because the Janam XM2 mobile computer has wireless network capabilities (both 802.11b/g and Bluetooth), AEI tag data can easily be sent directly to other computer systems (see Paragraph 2.6). AEI data is sent in a comma delimited text file or a file containing T94 (S9203A) records. Either of these file types can be attached to an email or uploaded to an FTP server. The AI4100 Portable AEI reader can send AEI data files directly to as many as seven email addresses in addition to four FTP servers.

Some of the other capabilities of the AI4100 Portable AEI Reader are listed below:

- Displays AEI tag data in user-friendly format (see Figure 8).
- Allows manual entry of vehicle identification information in the event an AEI tag cannot be read (see Paragraph 2.7).
- Allows vehicles to be assigned to a track or a spot on a track (see Paragraph 2.4).
- Allows the user to assign track and spot names (see Paragraph 5.1).
- Allows the scanning of two tracks at the same time (see Paragraph 2.4).

## AI4100 Portable AEI Reader

- Allows for the scanning of special AEI tags that are programmed with track and spot information to eliminate the requirement of entering this information manually (see Paragraphs 7 and 8).
- Allows additional data to be added about vehicles (see Paragraph 3). There are twelve data fields available. The user can define and name seven of these fields. The other five fields are: two Maintenance Data fields, a Status field, a Consist field, and a Comments field.
- Allows the use of special barcode labels to enter maintenance and status information about a rail vehicle (see Paragraph 5.14). A barcode reader is integrated into the mobile computer.
- Allows up to 40 barcoded serial numbers to be entered for each railcar (see Paragraph 3.5).
- Allows for the easy development of custom applications.
- Enables other vendors (OEMs) to develop special applications for the portable reader (see Paragraph 9). The portable reader allows other applications to easily access tag and barcode data and send their generated data as files attached to emails or uploaded to an FTP server.
- Allows the portable reader to access data from other devices (scales, wayside sensors, etc.) via a Bluetooth or Wi-Fi connection and associate this data with AEI tag reads.
- Sends AEI tag data in real time to other devices via a Bluetooth or a network TCP/IP connection (see Paragraph 5.7).

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## 2. QUICK START

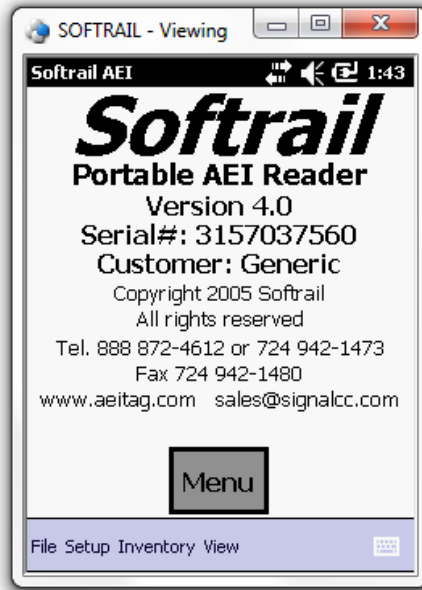
### 2.1. Initial Startup

The AI4100 Portable AEI Reader is shipped with the power off. To power up the unit, press the red power button in the lower left corner of the unit (see Figure 5). This will cause the computer to boot up and automatically start the Softrail AEI Portable Reader program. This program must be running and shown on the display for the system to read AEI RF tags and barcodes. The AI4100 information display will first appear (see Figure 6).



Figure 5 - AI4100 Buttons

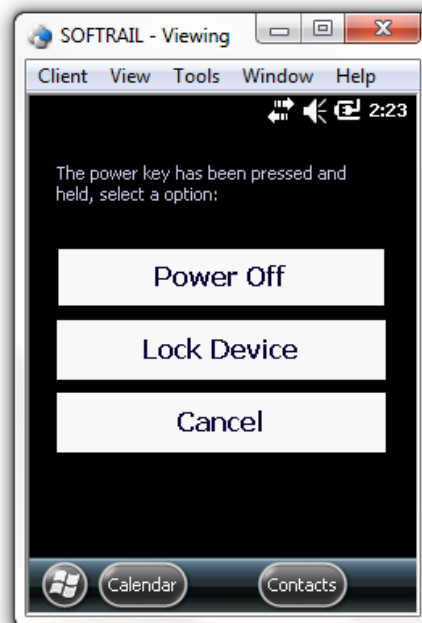
# AI4100 Portable AEI Reader



**Figure 6 - AI4100 Information Display**

## 2.2. Power Off

To power down the unit, press and hold the power button. A power off display will appear (see Figure 7).



**Figure 7 - Power Off Screen**

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### 2.3. Reading AEI Tags

There are three buttons that can start the RF reading of an AEI tag. These are at the top on the left hand side of the computer, at the top on the right hand side, and the large red button just below the screen (see Figure 5). When any of these buttons is pressed and held, the computer will turn on the AEI tag RF reader and attempt to read a tag. A "Reading Tag" message will appear on the screen. It will continue attempting to read a tag until a tag is read or the button is released. If a tag is read, the information in the tag will be displayed (see Figure 8). If not, a "No Tag Read" message will appear.



**Figure 8 - AEI Tag Display**

Please note the following when attempting to read an AEI tag:

- The Softrail AEI Tag Reader Software program must be on the screen. If not, press the Windows Flag button on the left side just below the screen (see Figure 5). If the program list screen (see Figure 9) does not appear, press this button again. Tap the AEI Reader icon to start the program.

A second way to start the Softrail AEI Tag Reader Software is to power down the unit by holding down the Power button until the Power Off screen appears (see Figure 7) and then tap the Power Off button. Press the Power button again to power up the unit, and the Softrail AEI Tag Reader Software will automatically start running.

- The AEI tag is designed to be mounted against metal. If it is not mounted against metal it will have a very short read range. The AI4100 AEI Portable Reader should be able to read all tags mounted against metal that are within three feet of the antenna.
- To read tags, point the portable reader at the AEI tag so that the portable reader's antenna surface is parallel to the surface of the tag.

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- If attempting to read tags at longer distances, wave the portable reader up and down.
- Depress one of the three buttons referenced above until a tag is read or you no longer want to attempt to read the tag.



**Figure 9- Program List Screen**

### 2.4. Placing Rail Vehicles on Tracks

Prior to reading rail vehicle AEI tags, track information should be entered into the portable reader.

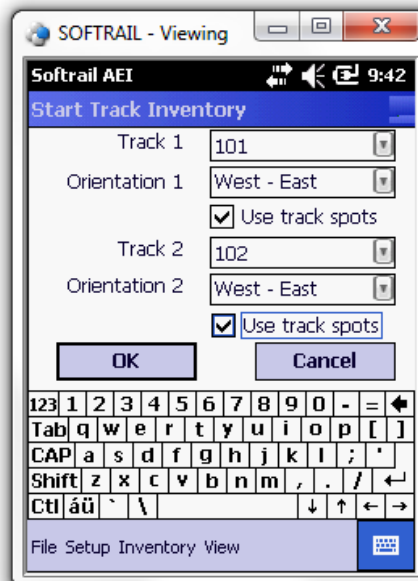
There are two methods for assigning rail vehicles to a track.

The first method for assigning rail vehicles to a track is to manually enter the track information into the portable reader and then read the tags on the track. To manually enter information about the track, tap the Menu button on the screen. This will cause a pop-up menu to appear (see Figure 10).



**Figure 10 - Start Track Inventory Menu**

Select the Start Track Inventory menu item by tapping on it. This will cause the Start Track Inventory dialog to be displayed (see Figure 11).



**Figure 11 - Start Track Inventory Dialog**

In the Start Track Inventory dialog you will either select a previously entered track name, by selecting a name from the pull down list (which appears when you tap on the down arrow located on the right side of the Track field), or manually enter a new track name. To enter a new track name, tap on the keyboard icon located near the bottom right of the screen. This will cause a keyboard to be displayed. Tap on the characters of the new name.



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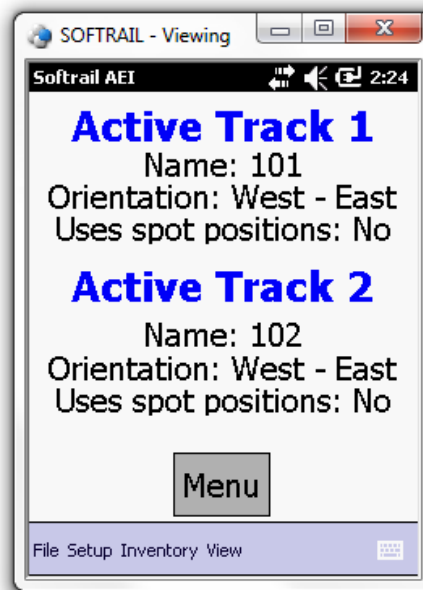
After you have entered a new track name, this name will appear in the Track pull down list when this dialog is displayed again.

The orientation of the track's inventory can be entered by selecting a direction item from the Inventory Orientation field's pull down list.

The default track inventory orientation can be set by going to the Default Values dialog (see Paragraph 5.10).

Some tracks can assign spot names to individual locations on the track. If you want to assign rail vehicles to individual track spot locations, check the Use Track Spots checkbox.

When this dialog is completed, tap on the OK button. This will cause the Active Track display to appear (see Figure 12). Please note that the AI4100 Portable Reader allows up to two tracks to be active at any given time. The process described above is completed for each track on which tags are to be read, and the Active Track display shown below is for a case where two tracks are active.



**Figure 12 - Active Track Display**

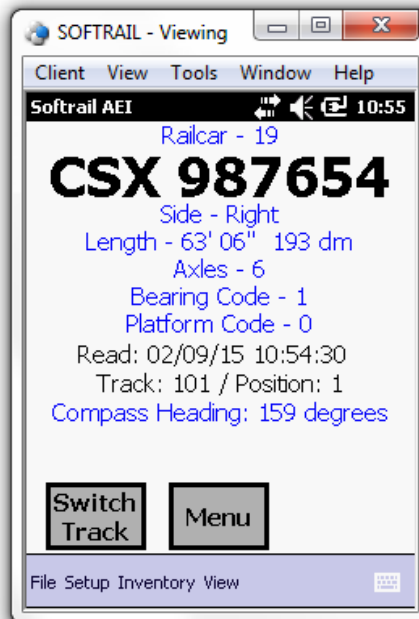
The second way to assign rail vehicles to a track is to read a special Track AEI tag before reading the tags on the rail vehicles on the track. Track AEI tags are placed at each end of the track and contain the same information about the track as with manual entry. See Paragraph 7 on the format of the Track AEI tag.

When a Track AEI Tag is read, a display similar to Figure 12 will be shown. In the example above a second Track AEI Tag has been read to allow rail vehicles on two adjacent tracks to be scanned in the same session.

The AI4100 portable reader has a built-in compass. It uses this compass to determine on which track the current rail vehicle is located by remembering in which direction the previous tag was read.

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If the reader does not have a good compass reading or does not have prior information on the direction of each track, the user can change the assignment of a vehicle from one track to the other by depressing the Switch Track button shown in Figure 13 or by reading the same vehicle's AEI tag a second time. Each consecutive reading of the same vehicle's AEI tag will switch the vehicle from one track to the other.



**Figure 13 - Switch Track Button**

The portable reader will continue assigning the rail vehicles to either of the two active tracks until one of them is deactivated by the reading of a second Track Tag on the track or until the user issues a command to the portable reader to stop taking inventory on the track (see Paragraph 2.5). The taking of inventory on the other track will continue until a second Track Tag is also read on that track or until the user issues a command to the portable reader to stop taking inventory on the second track.

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## 2.5. Ending Track Inventory

There are two methods to end taking track inventory. The first method is via the Menu button. Tap on the Menu button, which will cause a pop-up menu to appear (see Figure 14).



**Figure 14 - End Track Inventory Menu**

Select the End Track Inventory item for the track on which you are done taking inventory. This will end inventory for the track. All subsequent vehicle tag reads will not be shown on the track until Start Track Inventory is again selected or a Track Tag is read.

When track inventory is ended, the portable reader will ask if you want to send the track inventory to another system. If you respond "Yes", the Send Track Inventory dialog shown in Figure 15 will be displayed.

If you are using Track Tags, reading the Track Tag at the end of the track opposite from which the first Track Tag was read will also end taking inventory for that track.

## 2.6. Send Track Inventory

The Send Track Inventory dialog (see Figure 15) allows the user to enter the track inventory's file format and how the track inventory will be sent.

The portable reader can send track inventory in three types of file formats. The T94 (S9203A) format is the standard format used for communication between wayside AEI readers and railroads' host computers. Information about this format can be found in the Association of American Railroads' AEI Standard S9203, which can be purchased from the Association of American Railroads ([www.aar.org](http://www.aar.org)).

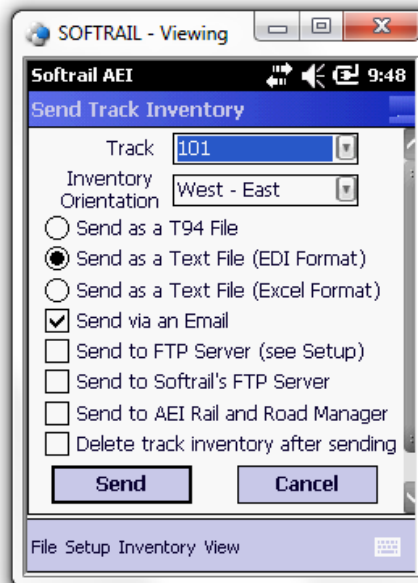
The second format is a comma delimited text file. This format uses Electronic Data Interchange (EDI) type records. This file has many different types of records and is generally

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used for computer-to-computer communications. For information about the format of this type of file, go to Paragraph 13.

The third format is also a comma delimited text file. We refer to it as the Excel file format since it was designed so that files in this format can be easily imported into most commercial word processing, spreadsheet and database programs. For information about the format of this type of file, go to Paragraph 13.

Track inventory in any of the file formats can be sent as an attachment to an email and/or a file directly sent to an FTP server. To use either of these options the email server name or FTP server name, user name, and password must be entered into the portable reader prior to attempting to send inventory. Information on setting up the email or FTP functions can be found in Paragraphs 5.3 or 5.5, respectively. Files can be sent to as many as seven email addresses. For information on entering email addresses into the system, go to Paragraph 5.4.



**Figure 15 - Send Track Inventory Dialog**

The portable reader can also send track inventory to Softrail's AEI Rail and Road Manager program directly via a TCP/IP connection (see Paragraph 5.2).

For more information about the AEI Rail and Road Manager software program contact Softrail at 888 872-4612 or 724 942-1473 or go to Softrail's web page at [www.aeitag.com](http://www.aeitag.com).

Once the Send button is tapped the message or messages will be placed into a queue for transmission. Up to 200 messages can be in the message queue waiting for transmission.

When the portable reader sees there are one or more messages to transmit it will attempt to make a network connection. If a network connection is not available, the reader will store the

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message(s) until a connection is available and then automatically send all pending messages.

To find the status of pending transmission messages, tap the View menu item near the bottom of the screen and select the Message Status item. This will cause the Message Status dialog shown in Figure 16 to be displayed.



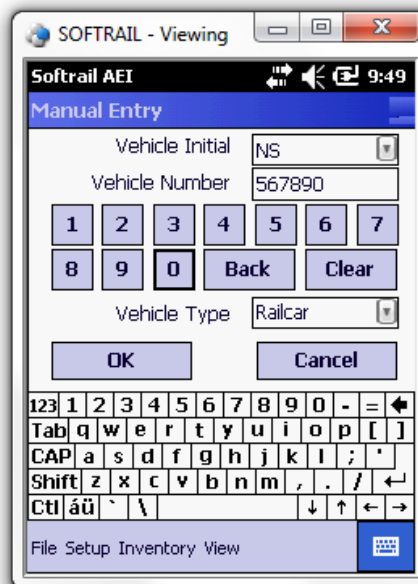
**Figure 16 - Message Status Dialog**

The Message Status dialog shows the status of all of the messages that are waiting to be sent and the last 100 messages that were sent.

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### 2.7. Manual Entry of Vehicle Identification

There will be situations where a rail vehicle has a bad tag or is missing a tag. Vehicle identification information can be manually entered. To manually enter vehicle identification information, tap anywhere on the screen, which will cause a pop-up menu to be displayed (see Figure 14). Select the Manually Enter Tag Info menu item, and the Manual Entry dialog shown in Figure 17 will appear.



**Figure 17 - Manual Entry Dialog**

The Vehicle Initial can either be selected from a list of previously entered Vehicle Initials in the Vehicle Initial field's pull down list (which appears when you tap on the down triangle located on the right side of the Vehicle Initial field), or a new Vehicle Initial can be typed in using the keyboard. If the keyboard is not displayed, tap on the keyboard icon located near the bottom right of the screen. This will cause the keyboard to be displayed. Tap on the characters of the new Vehicle Initial. Tapping the keyboard icon a second time will cause the keyboard to disappear.

After you have entered a new Vehicle Initial, this new Vehicle Initial will appear in the Vehicle Initial's pull down list when the dialog is displayed again.

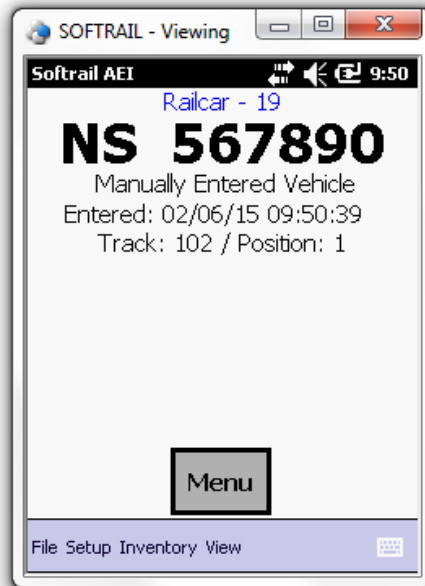
The default Vehicle Initial can be set by going to the Default Values dialog (see Paragraph 5.10).

The Vehicle Number field must contain between 1 to 6 digits to be accepted. The portable reader will insert any leading zeroes. Numbers can be quickly entered into this field by tapping the number buttons under this field. It is not necessary to select the Vehicle Number field (by tapping it) prior to tapping on these number buttons.

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The Vehicle Type can be either Locomotive or Railcar and is selected from this field's pull down list.

When the OK button is tapped, the screen shown in Figure 18 will be displayed.



**Figure 18 - Manually Entered Vehicle Display**

This display shows that a vehicle's data was manually entered and when the entry occurred. As with vehicles entered via tag reads, manually entered vehicle information can be included in track inventory and can be sent to other systems via the internet.



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### 2.8. Recording Serial Numbers

The AI4100 was designed to capture barcoded serial numbers on seals, products and parts. To capture, save and transfer the serial numbers for transmission to other systems, the rail vehicle must be assigned to a track.

However, there will be cases when the rail vehicle is in a shop facility and not assigned to a track. To collect serial numbers on rail vehicles not assigned to a specific track, the portable reader creates a special track called “-Serial #s-“. To create this track and assign rail vehicles to it, tap the Menu button on the screen. This will cause a pop-up menu to appear (see Figure 19). Tap the “Start Collecting Serial #s” menu item.



**Figure 19 - Start Collecting Serial Numbers**

When finished collecting serial numbers, tap the Menu button again and tap the “End Collecting Serial #s” item. You will then be asked if you want to send the data. If you answer “Yes”, the “Send Track Inventory” dialog will appear (see Figure 15).

### 3. ADDITIONAL DATA FIELDS

When a vehicle is entered into the portable reader via an AEI tag read or manual entry, additional data can be entered about the vehicle and passed to other systems (only in a text file format, T94 does not support these additional data fields).

The additional data fields are broken down into four categories. These are:

- Vehicle comments
- System defined fields such as maintenance, status and consist
- User defined fields

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- Serial numbers

There are two methods for entering data into these fields. Data can be entered manually through a group of displays or entered via barcodes. For more information about entering information via barcodes go to Paragraph 5.14.

To manually enter information about a rail vehicle into these fields, tap the Menu button on the screen. This will cause a pop-up menu to be displayed (see Figure 14). Select the appropriate menu item for the type of additional data to be entered.

### 3.1. Vehicle Comments

When the Vehicle Comments menu item is tapped, the Vehicle Comments dialog shown in Figure 20 will appear.



**Figure 20 - Vehicle Comments Dialog**

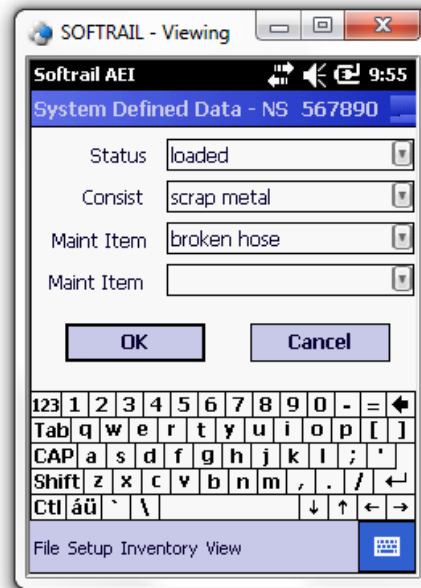
To display the keyboard, tap the white keyboard icon in the bottom right corner. Tapping this icon a second time will cause the keyboard to disappear.

Up to 200 characters of comments about a vehicle can be entered.

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### 3.2. Vehicle System Defined Fields

When the Vehicle Systems / Maintenance Fields menu item is tapped, the System Defined Fields dialog shown in Figure 21 will appear.



**Figure 21 - System Fields Dialog**

To display the keyboard, tap the white keyboard icon in the bottom right corner. Tapping this icon a second time will cause the keyboard to disappear.

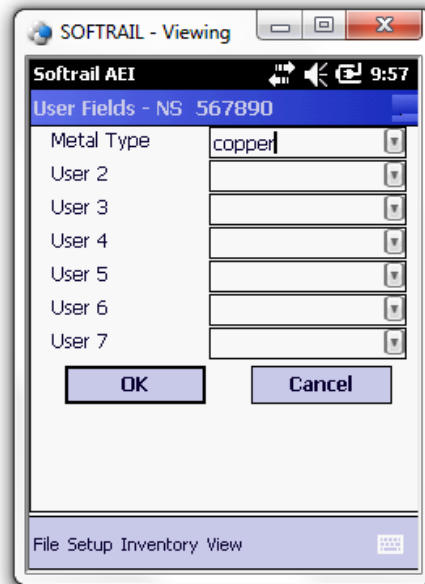
There are four system-defined fields. The user can enter any data into these fields or use each field's pull down list.

The system will remember all entries into these fields and add them to the fields' pull down lists the next time this dialog is displayed.

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### 3.3. Vehicle User Fields

When the Vehicle User Fields menu item is tapped, the User Fields dialog shown in Figure 22 will appear.



**Figure 22 - User Fields Dialog**

To display the keyboard, tap the white keyboard icon in the bottom right corner. Tapping this icon a second time will cause the keyboard to disappear.

The user can specify up to seven fields of data that will be maintained for a rail vehicle. The name of each field can be entered using the User Field Name Setup dialog (see Paragraph 5.13).

The user can enter any data into these fields or use the fields' pull down lists.

The system will remember all entries into these fields and add them to the fields' pull down lists the next time this dialog is displayed.

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### 3.4. Rail Vehicle Data Field Display

When a rail vehicle tag is read, the AEI Tag display is shown (see Figure 8). When data is entered into one of the vehicle's data fields, the Rail Vehicle Data Field display in Figure 23 will be shown.



**Figure 23 - Rail Vehicle Data Field Display**

This display shows all user-entered data for the rail vehicle with the exception of the Comments field.

## AI4100 Portable AEI Reader

### 3.5. Vehicle Serial Numbers

When the Vehicle Serial Numbers menu item is tapped, the Serial Number Edit dialog shown in Figure 24 will appear.



**Figure 24 - Serial Numbers Edit Dialog**

To display the keyboard, tap the white keyboard icon in the bottom right corner. Tapping this icon a second time will cause the keyboard to disappear.

The user can enter up to 40 serial numbers per vehicle. Serial numbers can be entered manually or via the barcode reader.

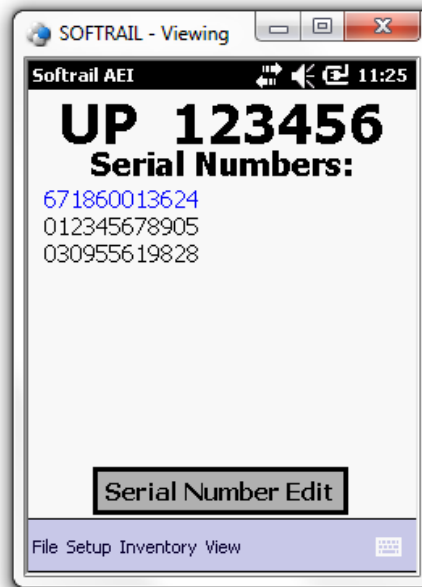
Please note that in order to associate barcoded serial numbers with a rail vehicle, the vehicle must be assigned to a track. When a vehicle is in a repair shop, a track called “-Serial #-” will be created if the “Start Collecting Serial #s” menu item is selected after the Menu button is tapped (see Paragraph 2.8).

Please note that barcodes can also be used to enter information into the user-assigned fields. This mode of information entry is called Barcode Translation. Go to Paragraph 5.14 for more information about using this mode. In the Barcode Translation mode barcoded serial numbers will not be recorded.

## AI4100 Portable AEI Reader

### 3.6. Rail Vehicle Associated Serial Numbers Display

When a barcoded serial number is read, the Rail Vehicle Serial Number Display will be shown (see Figure 25). The display will show the last 20 barcodes read for the railcar with the latest shown in blue at the top of the leftmost column.



**Figure 25 - Rail Vehicle Serial Number Display**

The Serial Number Edit button will allow the user to display the Serial Number Edit Dialog (see Figure 24) to add, delete or modify the serial number(s).



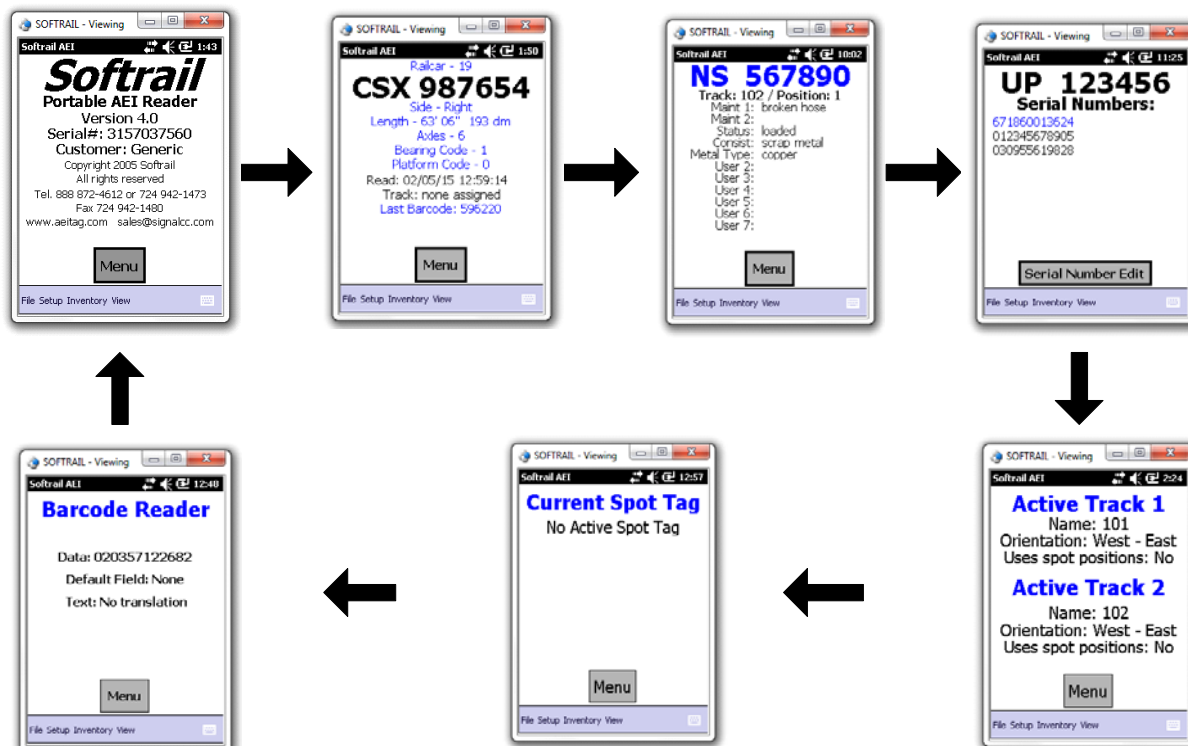
# AI4100 Portable AEI Reader

## 4. SCREEN DISPLAYS

There are seven screen displays. These are:

- **Information Display**
- **AEI Tag Display** (only displayed when a vehicle tag has been read or manually entered)
- **Rail Vehicle Data Field Display** (only displayed when a vehicle tag has been read or manually entered)
- **Rail Vehicle Serial Number Display** (only displayed when a vehicle tag has been read or manually entered)
- **Active Track Display**
- **Current Spot Tag Display** (only displayed if there is an active track which uses track spots)
- **Current Barcode Display** (only displayed if there has been no vehicle tag read or a barcode has been translated into a text entry in one of the vehicle's fields)

You can cycle through these displays in the above order by tapping anywhere on the top half of the screen. Each time you tap, the next screen will appear (see Figure 26). If a rail vehicle tag has not been read or manually entered, the AEI Tag, Rail Vehicle Data Field, and Rail Vehicle Serial Number displays will not appear.



**Figure 26 - Screen Displays**

# AI4100 Portable AEI Reader

## 5. SETUP FUNCTIONS

There are a number of setup functions. These functions are used to configure the portable reader to perform various tasks and reduce repetitive input.

The following is a list of setup functions:

- Track Setup - allows the user to edit track names and add T94 setup data for a track.
- AEI TCP/IP Setup - used to enter the IP address of the computer hosting Softrail's AEI Rail and Road Manager program.
- Email Setup – used to enter email outbound server information for sending data via email.
- Email Send to Addresses - used to enter up to seven email addresses that will receive AEI data.
- FTP Setup - used to enter FTP server information for sending files to an FTP server.
- Automatic Clock Update - used to enable the automatic updating of the portable reader's time and date.
- Real-Time Tag Data Transmissions - used to enable the real-time sending of AEI tag data to another device via a Bluetooth or network TCP/IP connection.
- Contact information - used when sending emails and maintenance information.
- Default Values - allows the user to enter a default vehicle initial for the manual vehicle entry dialog and default track orientation when the user starts taking track inventory.
- Memorized Data Maintenance - many data fields have pull down lists of previously entered data. This function allows the user to edit the pull down (memorized) lists.
- Portable Reader Identifier - allows the user to assign a name to the portable reader.
- User Field Names Setup - allows the user to enter the names of the user fields.
- Barcode Setup - used to specify the barcode parameters for barcodes that are used to enter data into a rail vehicle's data fields.
- Barcode Text Translation - used to enter a list of barcode numbers that are translated by the portable reader into text.
- Setup Password - allows the user to enter a password to prevent unauthorized users from changing the password settings
- OEM Folder Setup - used to define where the OEM's application can find files containing AEI tag data and where the OEM's application should save files that are to be transmitted via email or to an FTP server.

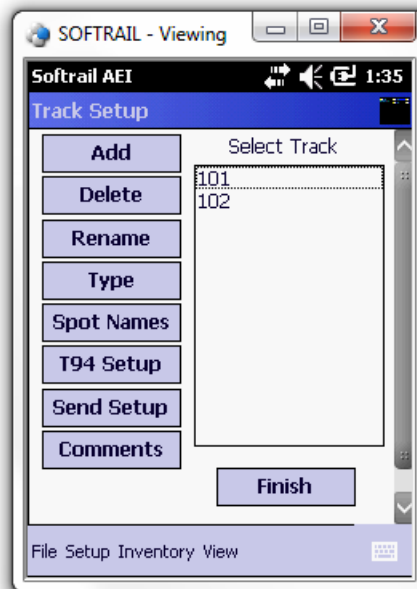
## AI4100 Portable AEI Reader

The following paragraphs define the setup functions in more detail.

### 5.1. Track Setup

To set up track values, tap the Track Setup menu item under the Setup menu.

This will cause the Track Setup dialog shown in Figure 27 to be displayed.



**Figure 27 - Track Setup Dialog**

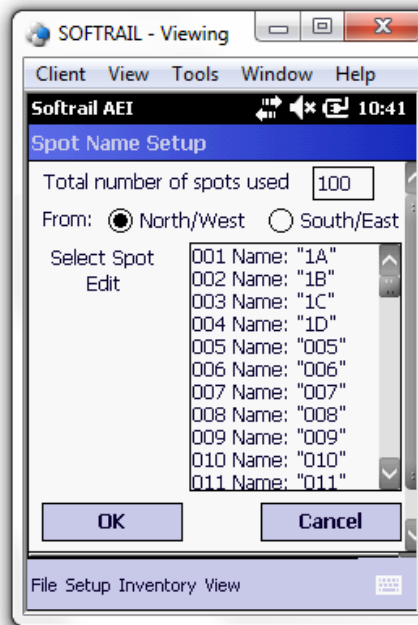
Previously entered track names can be deleted or renamed, and new track names can be added. To delete or rename a track, first select the track by tapping on it, and then tap the Delete or Rename button. Only one track name can be selected at a time.

To add a new track name tap the Add button, and an Add Track dialog will appear.

Tracks can be designated to have spot locations. To designate that a track will have spot locations, select the track and tap the Type button.

## AI4100 Portable AEI Reader

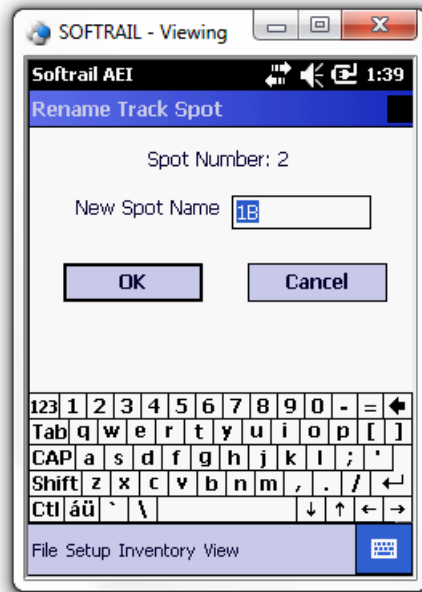
Names can be assigned to track spots. To assign names to track spots, select the track and tap the Spot Names button. The Spot Name Setup dialog shown in Figure 28 will appear.



**Figure 28 - Spot Name Setup Dialog**

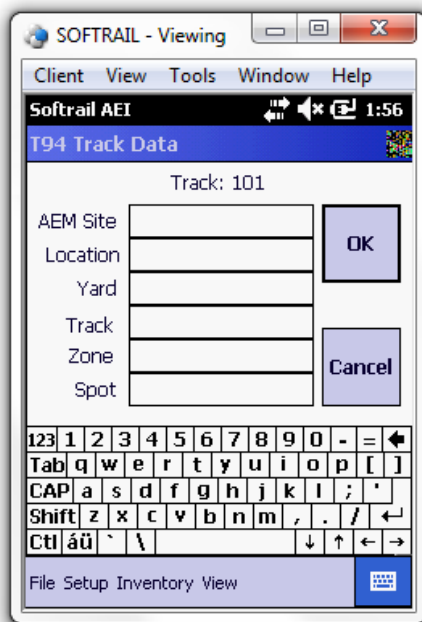
Up to 100 spot names can be assigned. The user can specify the direction in which the spot locations are listed. Spot names are by default given numerical names based on their position on the track (see Position 005, 006, 007, etc. in Figure 28). To assign a new name, tap the spot position you want to change, and the Rename Track Spot dialog shown in Figure 29 will appear.

# AI4100 Portable AEI Reader



**Figure 29 - Rename Track Spot Dialog**

T94 messages also have a requirement for an AEI site identifier (see Paragraph 2.1.5 in the S9203A standard). This information is entered by selecting a track in the Track Setup Dialog (Figure 27) and tapping the T94 Setup button. This will cause the T94 Track Data dialog to be displayed (see Figure 30).

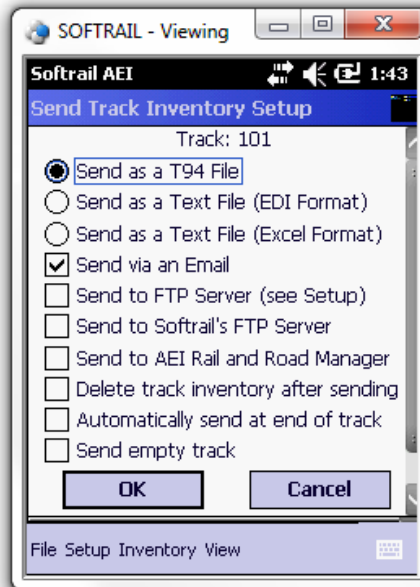


**Figure 30 - T94 Track Data Dialog**

## AI4100 Portable AEI Reader

If data is to be transmitted in a T94 format, at a minimum, the AEM Site identifier (7-character) must be entered. All other fields can be left blank.

When the user stops taking inventory on a track (see Paragraph 2.5), he can request that the track's consist be sent to other systems. To set the default parameters for sending track information, select a track via the Track Setup Dialog (see Figure 27), and tap the Send Setup button. This will cause the Send Track Inventory Dialog shown in Figure 31 to appear.



**Figure 31 - Send Track Inventory Setup Dialog**

The portable reader can send track inventory in three types of file formats. The T94 format is the standard format used for communication between wayside AEI readers and railroads' host computers. Information about this format can be found in the Association of American Railroads' AEI Standard S9203, which can be obtained from the Association of American Railroads ([www.aar.org](http://www.aar.org)).

The second format is a comma delimited text file. This format uses Electronic Data Interchange (EDI) type records. This file has many different types of records and is generally used for computer-to-computer communications. For information about the format of this type of file go to Paragraph 13.

The third format is also a comma delimited text file. We refer to this format as Excel file format since it was designed so that files with this format can be easily imported into most commercial word processing, spreadsheet and database programs. For information about this type of file format, go to Paragraph 13.

Track inventory in any of the three file formats can be sent as an attachment to an email and/or a file directly sent to an FTP server. To use any of these options the email server name or FTP server name, user name, and password must be entered into the portable

## AI4100 Portable AEI Reader

reader's mobile computer prior to attempting to send inventory. Information on setting up the email or FTP functions can be found in Paragraphs 5.3 or 5.5, respectively. Files can be sent to as many as seven email addresses. For information on entering email addresses into the system go to Paragraph 5.4.

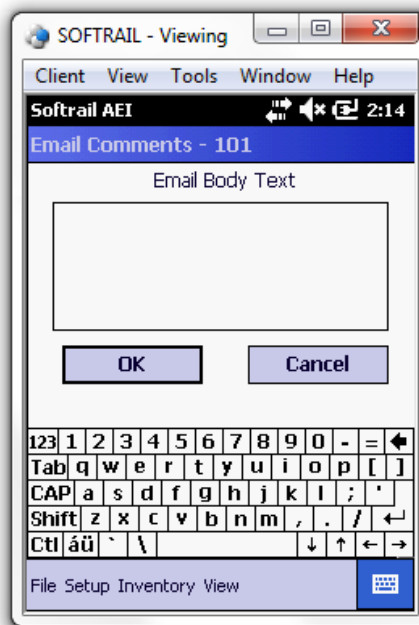
The portable reader can also send track inventory to Softrail's AEI Rail and Road Manager program directly via a TCP/IP connection (see Paragraph 5.2).

For more information about the AEI Rail and Road Manager software program contact Softrail at 888 872-4612 or 724 942-1473 or go to Softrail's web page at [www.aeitag.com](http://www.aeitag.com).

The user can cause the track inventory to be sent automatically when he finishes taking track inventory. The portable reader will typically not send track data if the track does not contain any rail vehicles. However, this can be overridden by checking the "Send empty track" box in this dialog. This will cause a message to be sent even if there are no rail vehicles on the track.

There is an email comments field associated with a track. To enter data into the comments field, select a track via the Track Setup dialog (see Figure 27), and tap the Comments button. This will cause the Email Comments dialog shown in Figure 32 to appear.

This dialog allows the user to enter comments about the track in the body text of an email if the message is being sent via an email.



**Figure 32 - Email Comments Dialog**



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### 5.2. AEI RR TCP/IP Setup

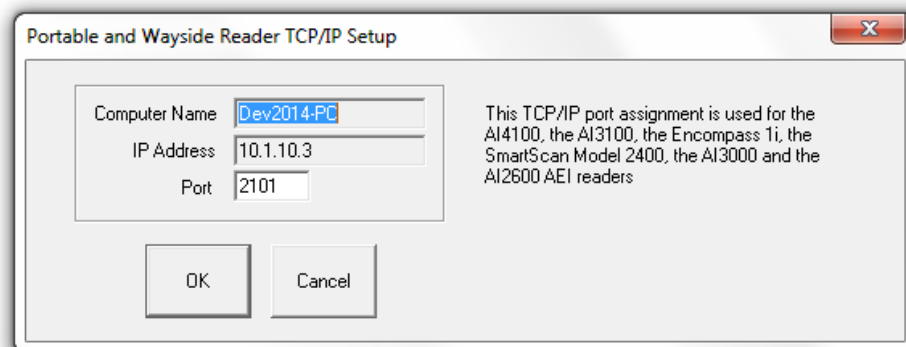
The portable reader is designed to work in conjunction with Softrail's AEI Rail and Road Manager program.

The AEI Rail & Road Manager software was designed as a low cost package for tracking rail vehicle movements in a rail yard. This is a Windows based program that can run under the Windows XP and 7 operating systems.

The AEI Rail & Road Manager software program allows the user to draw his/her own facility and represent the locations of railcars within the facility. The program can automatically position railcars and track railcar movements by using input from wayside and portable AEI tag readers. The user can also manually position railcars by dragging and dropping railcar icons from one track to another. A limited copy of the AEI Rail & Road Manager Program, called AEI Rail & Road Manager Express, is shipped on a CD rom with each AI4100 Portable AEI Reader.

To send track data to the AEI Rail and Road Manager program, the portable reader needs to know the IP address of the computer hosting the AEI Rail and Road Manager program and the port to which the program is listening for a connection.

To find this information in the AEI Rail & Road Manager program, select the AI4100 and SmartScan Model 2400 Portable Reader TCP/IP Setup menu item under the Portable Reader menu in the AEI Rail & Road Manager's menu bar. The dialog shown in Figure 33 will appear.



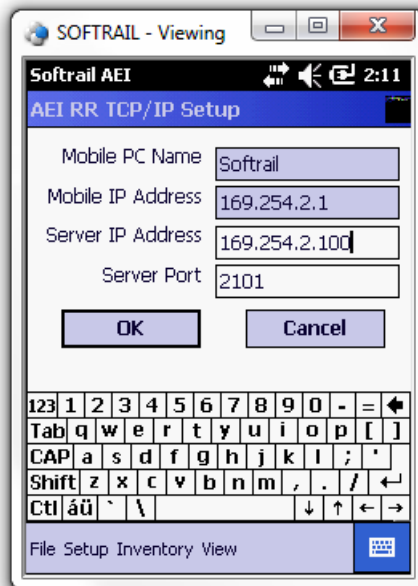
**Figure 33 - AI4100 Portable Reader TCP/IP Setup**

The listening port is a setup parameter in the AEI Rail and Road Manager program.

To enter this information into the portable reader, tap the Communications Setup menu item under the Setup menu and then the AEI RR TCP/IP Setup button.

## AI4100 Portable AEI Reader

This will cause the AEI RR TCP/IP Setup dialog shown in Figure 34 to be displayed.



**Figure 34 - AEI RR TCP/IP Setup Dialog**

Enter the IP address and port information that was displayed in AEI Rail and Road Manager's AI4100 Portable Reader Setup dialog (see Figure 33).

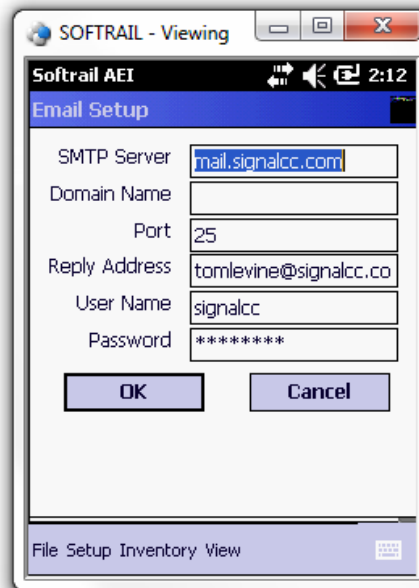
The display shown in Figure 34 also shows the portable reader's mobile computer name and the current IP address of the mobile computer.

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### 5.3. Email Setup

To send track inventory via an email attachment, the portable reader must have information on how to access the user's outbound email server. To enter this information, tap the Communications Setup menu item under the Setup menu and then the Email Setup button.

This will cause the Email Setup dialog shown in Figure 35 to be displayed.



**Figure 35 - Email Setup Dialog**

The Domain Name may not be required. Some outbound email servers require a different Domain Name than the Reply Name.

Some outbound email servers do not require a password, and this field can be left blank.

The reply address entered in this dialog is used as the reply address for all outbound emails.

The portable reader's mobile computer does not receive inbound emails.

## AI4100 Portable AEI Reader

### 5.4. Email Addresses

The portable reader can send emails with track inventory information to as many as seven email addresses. To enter the addresses to which emails will be sent, tap the Communication Setup menu item under the Setup menu and then the Email Send To Addresses button.

This will cause the Email Address Setup dialog shown in Figure 36 to be displayed.



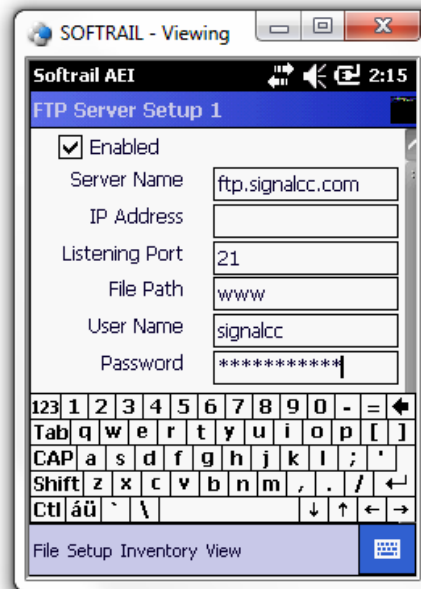
**Figure 36 - Email Address Setup Dialog**

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### 5.5. FTP Setup

To send track data to an FTP server, the portable reader must have information on how to access the FTP server. To enter this information, tap the Communications Setup menu item under the Setup menu and then the FTP Setup button.

This will cause the FTP Setup dialog shown in Figure 37 to be displayed.



**Figure 37 - FTP Server Setup Dialog**

The FTP Server must have either a Server Name or an IP Address. If both are present the portable reader will use the Server Name.

The Listening Port is almost always 21.

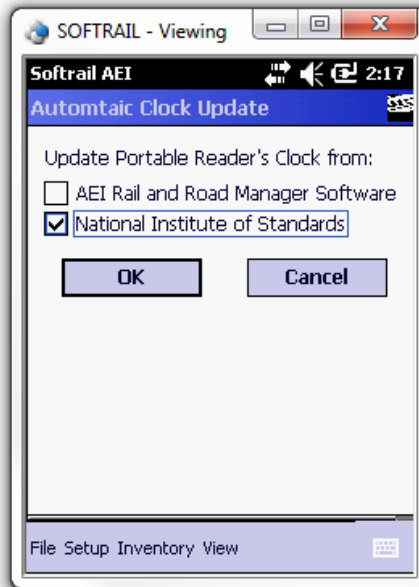
The portable reader sends files to the FTP server. It does not retrieve files from the FTP server.

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### 5.6. Automatic Clock Update

The portable reader can automatically update its date and time from either Softrail's AEI Rail and Road Manager software or the National Institute of Standards website.

To automatically update the portable reader's date and time from either of these locations, this function must be enabled. To enable either of these functions, tap the Communications Setup menu item under the Setup menu and then the Automatic Clock Update button. This will cause the Automatic Clock Update dialog shown in Figure 38 to be displayed.

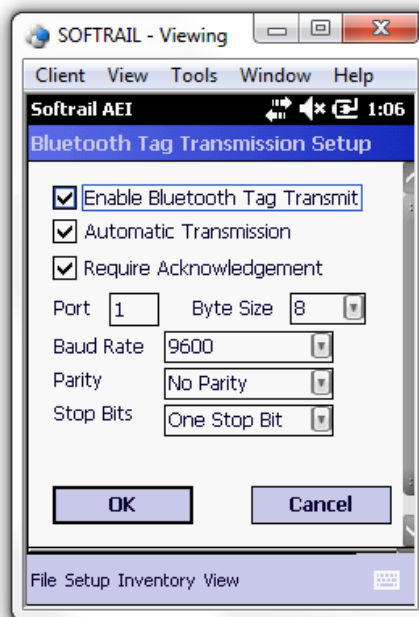


**Figure 38 - Automatic Clock Update Dialog**

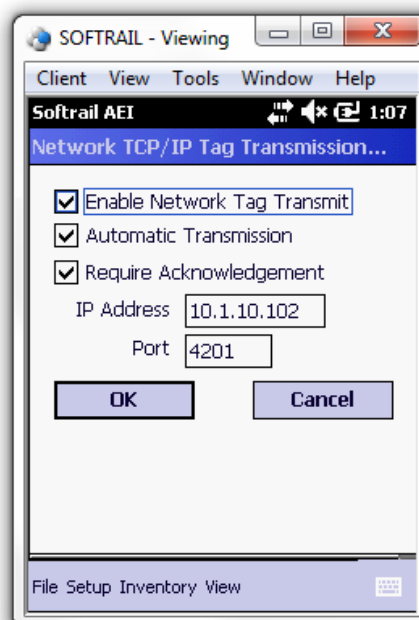
### 5.7. Sending AEI Tag Data in Real Time

The AI4100 can send AEI tag data to other devices in real time via either a Bluetooth Serial or a Network TCP/IP connection.

When either or both of the transmission functions are enabled, the portable reader will send the tag data via these connections to another device. To enable and configure these functions, tap the Communications Setup menu item under the Setup menu and then either the Bluetooth Tag Transmit or the Network Tag Transmit buttons, and either Figure 39 or Figure 40 will appear.



**Figure 39 - Bluetooth Real-Time Tag Transmission Setup**



**Figure 40 - Network TCP/IP Tag Transmission Setup**

To send AEI tag data, check the Enable box. If you want to send the data as soon as the portable reader reads the tag, check the Automatic Transmission box. If this box is not checked, the portable reader will ask if you want to send the data. If you decide to not send it you can request it to be sent at another time by tapping the Menu button when the tag's data

## AI4100 Portable AEI Reader

is displayed (see Figure 8) and then selecting the Send Tag via Bluetooth or Send Tag via Network menu item.

With each AEI tag read the portable reader will send a single record ending with a carriage return (hex 0D). This record will only be sent if there is a connection (Bluetooth or Network) to your device. If there is no connection, the portable reader will store this message until a connection is made and it can be sent.

The following table is the layout of the record for the rail vehicle tag:

Field	Description	Values
1	Date and time when the tag was read	<p>The field is in the following format MM/DD/YYYY(space)HH:MM</p> <p>MM = month of year DD = day of month YYYY = year HH = hour MM = minute</p>
2	Sequence Number	<p>Numeric 4 digits</p> <p>The sequence number of the file from 0 to 9999. This sequence number is incremented each time a new file is created. When it reached 10,000, it is reset to 0</p>
3	Data format code	<p>Two digits</p> <p>51 = standard rail vehicle identification format</p> <p>(see AAR Specification S-918 for all codes)</p>
4	Frame Marker	<p>One digit</p> <p>The number of the frame that was read. Dynamic tags can send multiple frames of data. Each frame is considered a separate tag read. Passive tags can only send one frame.</p>
5	Equipment group code	<p>One to two digits</p> <p>5 = locomotive 19 = railcar</p> <p>(see AAR Specification S-918 for all codes)</p>



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6	Vehicle initial (reporting marks)	Four alpha characters The field is filled with spaces if the vehicle initial is less than four characters
7	Vehicle number	One to six digits
8	Side indicator	Left or Right
9	Length in decimeters	1 to 4 digits
10	Number of axles	1 to 2 digits
11	Bearing code	1 digit from 0 to 7 (see AAR Specification S-918 for codes)
12	Platform code (for railcars only)	1 to 2 digits from 0 to 15 (see AAR Specification S-918 for codes)

The following are examples of records created when tags are read:

```
01/16/2006 10:58,0001,"51","1","5","NS ","1526","Left","183","4","1"
01/16/2006 10:58,0002"51","1","19","UP ","123456","Left","161","4","1","0"
01/16/2006 10:58,0003"51","1","19","CSX ","987654","Right","193","6","1","0"
01/16/2006 10:58,0004"51","1","19","DEFX","112344","Left","185","4","1","0"
```

You can specify if the portable reader must receive an acknowledgement message from your device before deleting the AEI tag data message in the portable reader. If this option is selected and it does not receive an acknowledgement message, it will continue to try to send the AEI tag data message until an acknowledgement is received.

The following table is the layout of the acknowledgement message:

Field	Description	Values
1	ACK	ACK
2	Sequence Number of the message being Acknowledged	Numeric 4 digits  The sequence number of the file from 0 to 9999. This sequence number is incremented each time a new file is created. When it reached 10,000, it is reset to 0

The following is example of an acknowledgement record:

```
ACK,0001
```

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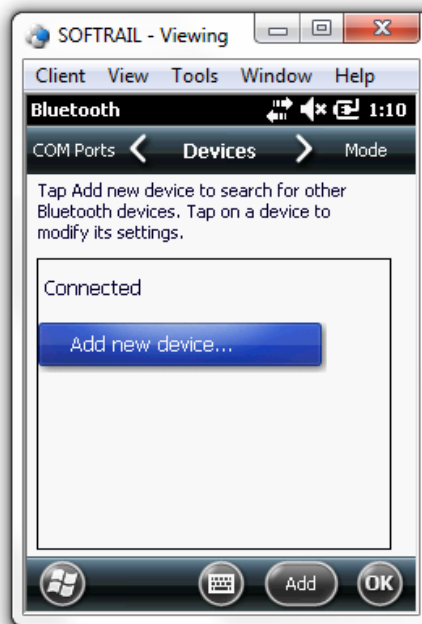
### 5.7.1. Bluetooth Tag Data Transmission

The Bluetooth Real-Time Tag Transmission Setup Dialog's Port field's (see Figure 39) value must correspond to the port assigned when the serial device was Bluetooth paired to the AI4100 Portable Reader. Paragraph 5.7.2 provides instructions for Bluetooth pairing.

The Byte Size, Baud Rate, Parity and Stop Bits fields must contain the same values that are being used by the serial device.

### 5.7.2. Bluetooth Pairing Instructions

To Bluetooth pair a serial device to the AI4100 Portable Reader, tap the Window's flag at the bottom left of the screen, then tap Settings and Bluetooth. The screen shown in Figure 41 will appear. Typically this display will list the names of the serial devices that are connected to the AI4100 Portable Reader. In the screen shot below, however, there are not yet any serial devices connected to the portable reader.



**Figure 41 - Adding Bluetooth Device**

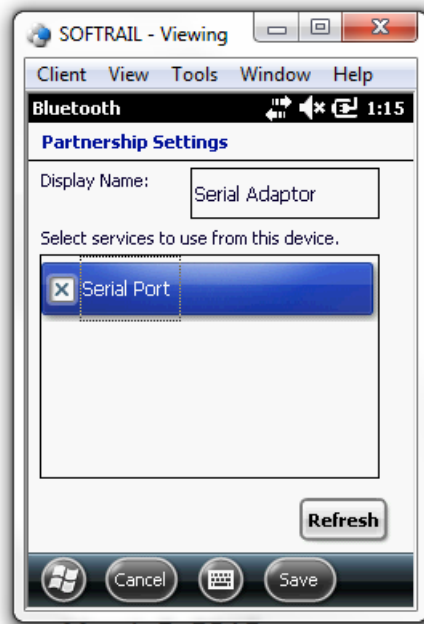
Make sure the serial device that is being paired is on and set to be discoverable. Tap the "Add new device" on the screen, and the portable reader will begin searching for your device. When it finds the device, it will appear in the display shown in Figure 42. Please note that the device called "Serial Adapter" in Figure 42 is an example, and your device may have a different name.



**Figure 42 - Found Bluetooth Device**

Tap your device's name and then tap next. The program will ask you to enter a passcode. The passcode for your device will either be in a pop-up screen on the device or in the device's manual. After entering the passcode, the screen will show it as a disconnected device in the list of Bluetooth devices (Figure 41). Tap the device's name, which will cause the screen shown in Figure 43 to appear. Check the Serial Port, and then tap Save.

This will return you to the list of Bluetooth devices (Figure 41) At the top of the screen, tap COM Ports, which will cause the screen shown in Figure 44 to appear.



**Figure 43 - Bluetooth Serial Port Selection**

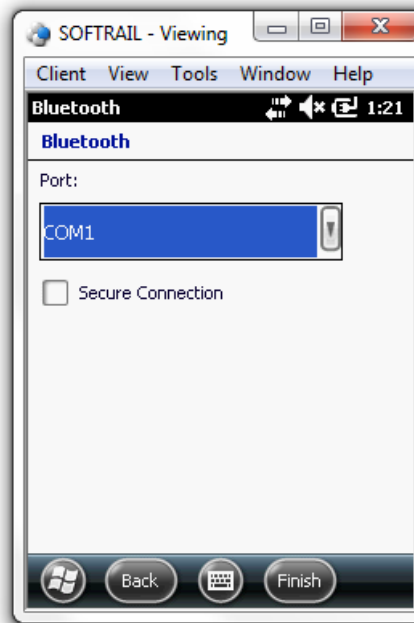


**Figure 44 - New Bluetooth COM Port**

Tap "New Outgoing Port", and on the next screen select your device's name and tap Next. On the screen shown in Figure 45 select a port. If you select Com1 then 1 must appear in the Port field of Figure 39. If you select Com2 then 2 must appear, etc.

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Tap Finish and OK on the next screen.



**Figure 45 - Assign Bluetooth COM Port**

Your device is now paired to the AI4100 Portable Reader. Depress the Reset button on the back of the portable reader, which will cause it to reboot and restart the Softrail AEI Reader program.

## 5.7.3. Network Tag Data Transmission

When the portable reader tries to send AEI tag data to your device it first will try to make a network connection. The IP address of your device and port to which it is listening must be entered into the Network TCP/IP Tag Transmission Setup dialog (see Figure 40).

## 5.8. Network Communications

The AI4100 Portable AEI Reader can communicate with a network three different ways.

- USB connection to a Windows computer
- Wi-Fi using the AI4100 Portable Reader's built-in Wi-Fi transceiver
- SmartPhone Wi-Fi Hotspot

The following paragraphs discuss each of these:

## AI4100 Portable AEI Reader

### 5.8.1. USB Connection to a Windows Computer

There is a USB connector on the back of the charging cradle, which allows a connection to a Windows computer. When the AI4100 Portable Reader is inserted into the charging cradle, which has been connected to the USB port of a Windows computer, and turned on, Windows Mobile should automatically open. There may be several screens requesting the user to register the device prior to the screen showing the connection status (see Figure 46). These are standard Microsoft screens, which are not important and can be ignored. Click the “Connect without setting up your device” button to get a connection to your network. If you do not click this button, you will have a connection to your computer, but not your network.



**Figure 46 - Window Mobile**

To change the IP address assigned to the AI4100 Portable Reader through the USB connection, go to the program list screen (see Figure 9), tap the Settings icon and the Connections folder. This will cause the connection screen in Figure 47 to appear. Tap the Wi-Fi icon and the Network Adapters item at the top of the screen. Select the Remote-NDIS Host Adapter, and then enter the IP address.

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### 5.8.2. Wi-Fi Connection

The AI4100 Portable Reader has a built-in Wi-Fi transceiver. To set up your wireless network, go to the program list screen (see Figure 9), tap the Settings icon and the Connections folder. This will cause the connection screen in Figure 47 to appear. Tap the Wi-Fi icon and the Wireless item at the top of the screen, and then follow the instructions to find your wireless network and set it up.



**Figure 47 - Wireless Setup**

### 5.8.3. SmartPhone Connection

Many SmartPhones have the ability to create a Wi-Fi hotspot. The AI4100 Portable Reader can make a Wi-Fi connection to the SmartPhone to obtain access to the internet.

Contact your cellular carrier for information about creating a SmartPhone Wi-Fi hotspot.

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### 5.9. Contact Information Setup

To set up contact information, tap the Contact Information menu item under the Setup menu. This will cause the Contact Information dialog shown in Figure 48 to be displayed.

The screenshot shows a handheld device screen with the title 'SOFTRAIL - Viewing'. Below the title bar is a status bar with 'Softrail AEI', signal strength, volume, and a clock showing '1:29'. The main screen displays a 'Contact Information' dialog. The dialog has the following fields:

- Company: Softtrail
- Location: Eighty-Four PA
- Contact: Tom Levine
- Telephone: 724 942-1473
- Fax: 724 942-1480
- Email: tomlevine@signalcc.com

Below the fields are 'OK' and 'Cancel' buttons. At the bottom of the screen is a QWERTY keyboard. Below the keyboard is a navigation bar with the text 'File Setup Inventory View' and a blue button with a right-pointing arrow.

**Figure 48 - Contact Information Dialog**

Information entered in this display is used in the body of some email messages and in maintenance messages sent to Softtrail.

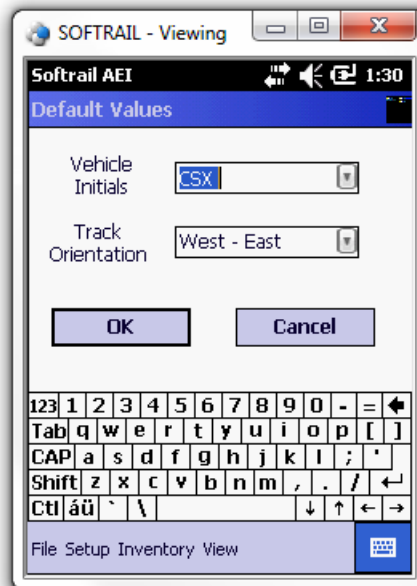


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### 5.10. Default Values Setup

To set up default values, tap the Default Values menu item under the Setup menu.

This will cause the Default Values dialog shown in Figure 49 to be displayed.



**Figure 49 - Default Values Dialog**

Default values for Vehicle Initial and track orientation can be entered into the system. The default value for the Vehicle Initial is used when vehicle identification is manually entered into the portable reader.

The Vehicle Initial can either be selected from a list of previously entered initials in the Vehicle Initial field's pull down list (which appears when you tap on the down arrow located on the right side of the Vehicle Initial field), or a new Vehicle Initial can be typed in. To enter a new Vehicle Initial, tap on the keyboard icon located near the bottom right of the screen. This will cause a keyboard to be displayed. Tap on the characters of the new initial.

After you have entered a new Vehicle Initial, the new Vehicle Initial will appear in the Vehicle Initial's pull down list when this dialog is displayed again.

The default track orientation is used when track inventory is started and the track name is entered.

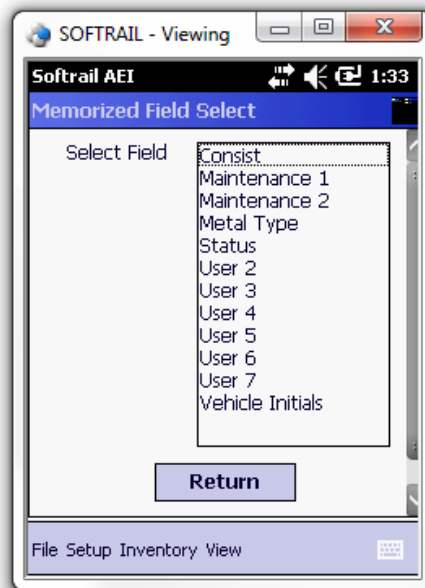
## AI4100 Portable AEI Reader

### 5.11. Memorized Data Maintenance

For many fields the portable reader remembers previous entries so they can easily be reused by simply selecting them from a pull down list. This eliminates retyping of common data entries.

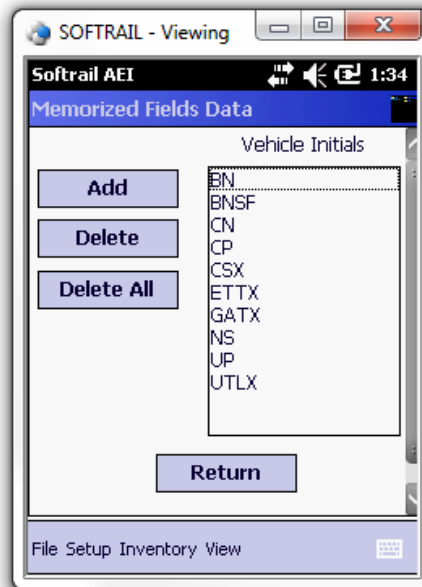
The portable reader has a function to maintain memorized lists of previously entered data. To access this function tap the Memorized Data Maintenance menu item under the Setup menu.

This will cause the Memorized Field Select dialog shown in Figure 50 to be displayed.



**Figure 50 - Memorized Field Select Dialog**

The Memorized Field Select dialog displays all of the fields on which the portable reader maintains memorized lists of data entries. To edit a particular field's list, tap on the particular field to be edited, and the Memorized Fields Data dialog will be displayed (see Figure 51).



**Figure 51 - Memorized Fields Data Dialog**

Previously entered values can be deleted or new values can be added to each particular field's memorized list. To delete an entry, first select the entry by tapping on it, and then tap the Delete button. Only one entry can be selected at a time.

## AI4100 Portable AEI Reader

### 5.12. Portable Reader Identifier

The user may assign a ten-character identifier to the portable reader. If the user does not assign an identifier, the portable reader will use the last four characters of its mobile computer serial number as the identifier.

To access this function select the Portable Reader Identifier menu item under the Setup menu.

This will cause the Portable Reader Identifier dialog shown in Figure 52 to be displayed.



**Figure 52 - Portable Reader Identifier Dialog**

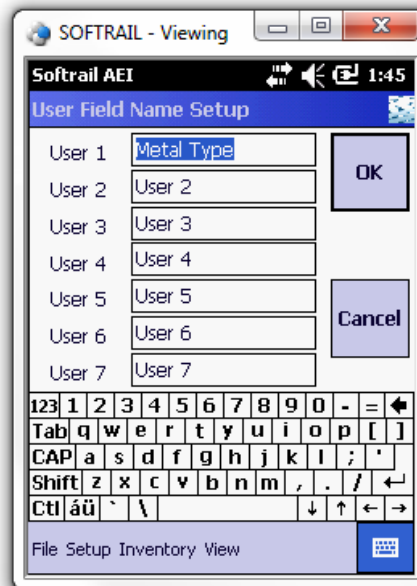
## AI4100 Portable AEI Reader

### 5.13. User Field Names Setup

The portable reader allows the user to define up to seven data fields. Data entered into these fields is maintained with the vehicle and can be sent to other systems in text file format.

The user can specify unique names for these fields by using the User Field Names Setup function. To access this function tap the User Field Names Setup menu item under the Setup menu.

This will cause the User Field Names Setup dialog shown in Figure 53 to be displayed.



**Figure 53 - User Field Name Setup Dialog**

## AI4100 Portable AEI Reader

### 5.14. Barcodes

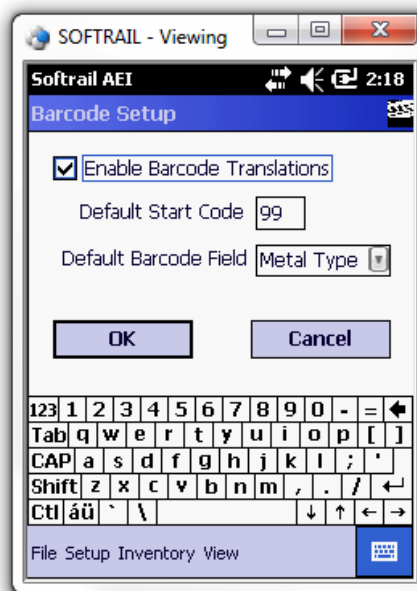
The AI4100 portable reader is designed to operate with a barcode reader. With the barcode reader, barcoded information about a rail vehicle can be quickly and easily entered.

There are two modes of operation for processing data from the barcode reader. Barcodes are either translated into data entries or captured as serial numbers. When barcode translations are enabled, the translated barcode data is entered into one of the 11 data fields (see Paragraph 3) that are associated with the rail vehicle.

When barcode translations are not enabled, the barcodes themselves are automatically entered into the current vehicle's serial number list (see Paragraph 3.5).

To read a barcode, press the second button from the top on the right side of the AI4100, the "OK" button, or the "ENT" button (see Figure 5). Please note that the barcode reader will not activate if the reader is attempting to read a tag.

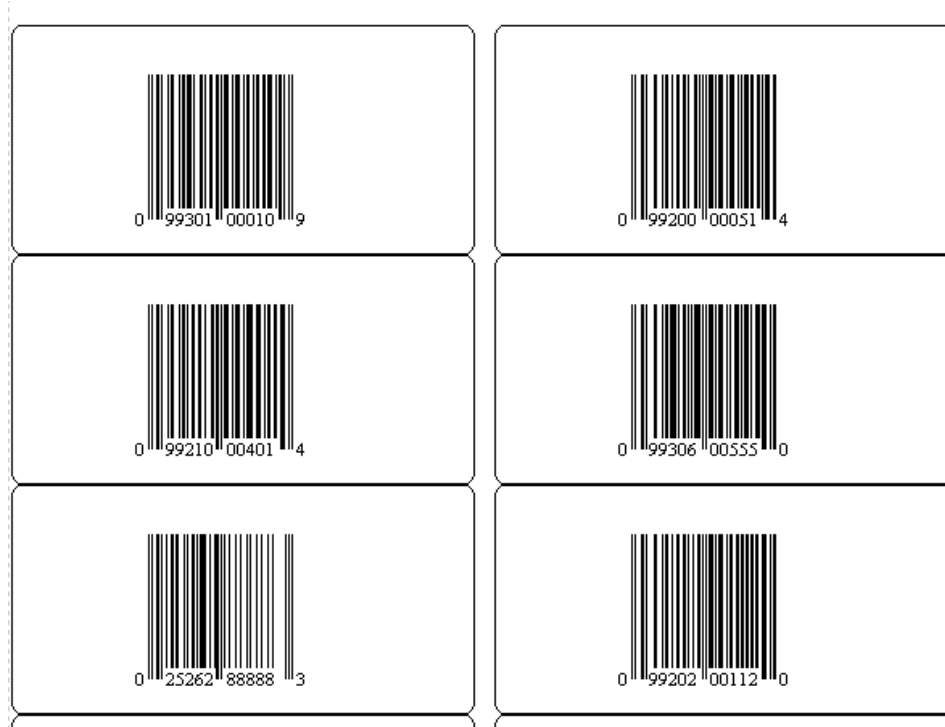
To enable or disable barcode translations, select the Barcode Setup menu item under the Setup menu. This will cause the Barcode Setup dialog shown in Figure 54 to appear.



**Figure 54 - Barcode Setup Dialog**

The portable reader is set up to read barcodes in the Universal Bar Code (UPC) format. The UPC format contains 12 digits. The first digit is usually 0 and specifies the Number Character System. The next ten digits are user specified, and the last digit is a check digit.

Figure 55 shows examples of barcodes.



**Figure 55 - Barcode Examples**

When in Barcode Translation mode, the portable reader reads the barcode and enters the information into one of the 11 data fields (see Paragraph 3) that are associated with the rail vehicle. The user can specify into which of the eleven fields data from a barcode will be entered and can also specify if this is a special barcode that was developed by the user for use with the portable reader.

The portable reader looks at the second and third digit of the barcode to determine if the barcode is to be translated. If these two digits are not the same as those entered into the Default Start Code field (99 in this example) in the Barcode Setup dialog (see Figure 54), the data from barcode reads are automatically entered into the current vehicle's serial number list (see Paragraph 3.5).

In Figure 55 the UPC label at the bottom left does not have "99" in the second and third digits and, therefore, its data (025262888883) would be entered in the vehicle's serial number list.

The user can specify his own unique set of barcodes that have special meaning to the portable reader. These barcodes have a special format that consists of three fields in the user-specified ten-digit number of the bar code.

# AI4100 Portable AEI Reader

Figure 56 is a table that shows the barcode field structure.

Field Description	Position	Field Length	Data
Numeric System Character	1	1	Usually 0
Default Start Code	2-3	2	Any two-digit combination specified by the user.
Field Code	4-6	3	Specifies the field into which the barcode data will be entered.  200 = Status Field 201 = Consist Field 211 = Maintenance 1 Field 212 = Maintenance 2 Field 301 = User 1 Field 302 = User 2 Field 303 = User 3 Field 304 = User 4 Field 305 = User 5 Field 306 = User 6 Field 307 = User 7 Field
User Data Field	7-11	5	Five digits of data that will be entered into the field specified in the Field Code field.
Check Digit	12	1	Barcode check digit, not user specified.

**Figure 56 - Barcode Field Structure**

Based on this structure, the barcodes in Figure 55 cause the following:

- Barcode 0 9930100010 9 - 00010 entered into the User 1 field
- Barcode 0 9920000051 4 - 00051 entered into the Status field
- Barcode 0 9921100401 4 - 00401 entered into the Maintenance 1 field
- Barcode 0 9930600555 0 - 00555 entered into the User 6 field
- Barcode 0 2526288888 3 - 025262888883 entered into the vehicle's serial number list, since 99 is not in the second and third digit
- Barcode 0 9920200112 0 – 099202001120 entered into the vehicle's serial number list, since 202 is not a legal Field Code



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The user can also have the portable reader translate the 5 digits of data in the barcode to a text string. For example, 00010 can be translated by the portable reader into "empty". Instead of 00010 appearing in the User1 field, the text string "empty" would appear.

To enter barcode text translations select the Barcode Text Translation item in the Setup menu. This will cause the Barcode Text Translation dialog shown in Figure 57 to appear.



**Figure 57 - Barcode Text Translation Dialog**

To add a new barcode translation, tap the Add button, and the Barcode Add/Edit dialog in Figure 58 will appear.

To delete or edit a translation, select the translation in the list and tap the Edit or Delete button.



**Figure 58 - Barcode Add/Edit Dialog**

## 5.15. Setup Password

The Setup Password function allows users to enable password protection so unauthorized personnel cannot make changes to any of the Setup Parameters in the portable reader.

To set up password protection, select the Setup Password menu item under the Setup menu. This will cause the Setup Password dialog shown in Figure 59 to be displayed.



**Figure 59 - Setup Password Dialog**

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Any time the user tries to change any of the Setup Parameters, the portable reader will ask for the password before making the change.

Once the Setup Parameters are unlocked by entering a password they will stay unlocked until the Lock Setup Parameters menu item under the Setup menu is selected.

### 5.16. OEM Folder Setup

The portable reader is designed to make it easy for other companies (OEMs) to develop their own applications to incorporate into the portable reader.

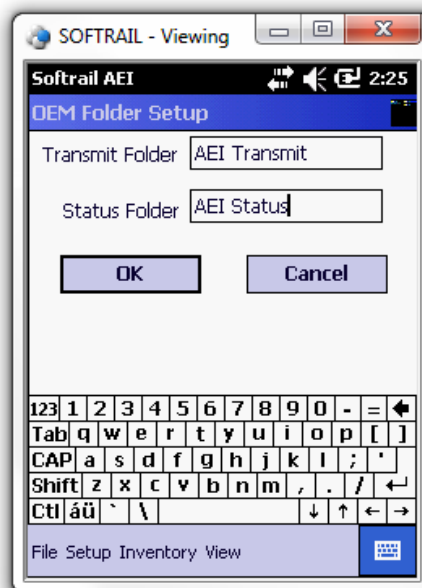
To assist OEMs, the portable reader provides easy access to AEI tag data and provides a simple method for applications to send their data to other systems via email attachments or as a file transfer to an FTP server.

Data transfer between the portable reader and an OEM's application is through a set of text files that are written into a specific folder in the portable reader's mobile computer.

The folder to which the files are written can be specified by using the OEM Folder Setup function.

To access this function, tap the OEM Folder Setup menu item under the Setup menu.

This will cause the OEM Folder Setup dialog shown in Figure 60 to be displayed.



**Figure 60 - OEM Folder Setup**

The Transmit Folder contains the OEM files that are to be transmitted by the portable reader, and the AEI Tag Folder contains the file that has the AEI tag and barcode data.

For more information on interfacing OEM applications, see Paragraph 9.

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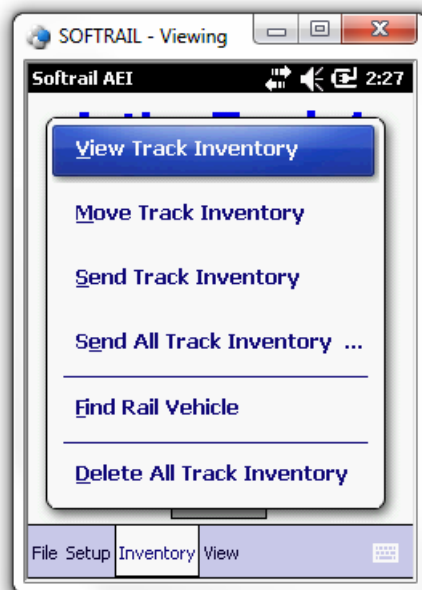
## 6. INVENTORY

The portable reader has a number of inventory functions, which allow the user to add and delete rail vehicles from tracks, move rail vehicles from one track to another, and change vehicles' positions on tracks.

To access the inventory functions, tap on the Inventory menu item, and the pop-up menu shown in Figure 61 will appear.

The inventory functions are:

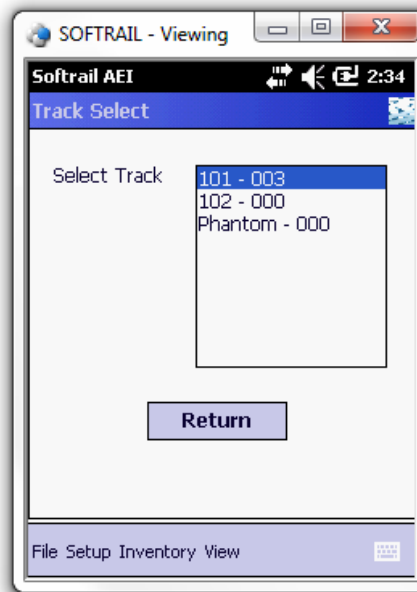
- View Track Inventory
- Move Track Inventory
- Send Track Inventory
- Send All Track Inventory
- Find Rail Vehicle
- Delete All Track Inventory



**Figure 61 - Inventory Menu**

### 6.1. View Track Inventory

To access the View Track Inventory function, tap the View Track Inventory menu item. The Track Select dialog shown in Figure 62 will then appear.



**Figure 62 - Track Select Dialog**

The Track Select dialog displays all of the tracks that have been entered into the portable reader. The number of rail vehicles that are on each track is displayed after the track's name in the list.

You will notice that at the end of the track list there is a track name called Phantom. The Phantom track is a fictitious track that is used as a temporary storage area in the portable reader for vehicles that have been deleted from one track, but have not yet been moved to a new track.

To view a track's consist, tap on the track name in the list, and the Track View dialog shown in Figure 63 will appear.



**Figure 63 - Track View Dialog**

The Track View dialog allows the user to add a vehicle, delete a vehicle, or delete all rail vehicles on a track.

### **6.1.1. Add Rail Vehicle**

To add a rail vehicle, first select the location in the consist where you want the vehicle to be added by tapping on the vehicle in the list that will be behind the vehicle to be added. If you want, for example, to add a vehicle between NS 1526 and CSX 987654 in the list shown in Figure 63, tap on CSX 987654 and then tap the Add button. The Manual Entry dialog shown in Figure 17 will then be displayed.

### **6.1.2. Delete Rail Vehicle**

To delete a vehicle, tap on the vehicle to be deleted, and then tap on the Delete button.

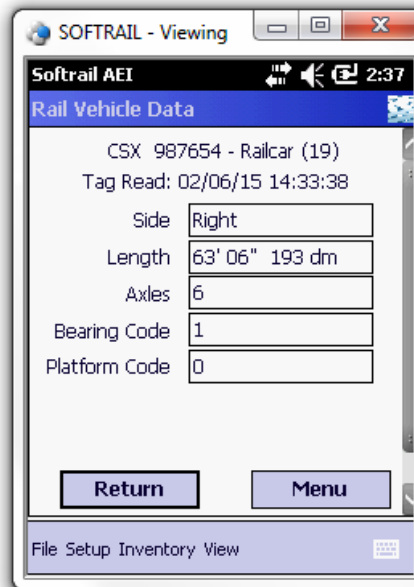
The Delete All button will delete all rail vehicles on a track.

### **6.1.3. Change Rail Vehicle Position on Track**

The Advance button is used to change the position of a rail vehicle on a track. To change a position of a rail vehicle, tap on the vehicle you want to move. Each time you tap the Advance button the vehicle will move up the list one position.

### **6.1.4. View and Change Rail Vehicle Data**

The View button allows the user to view and modify data about a rail vehicle. To use this function, tap on the rail vehicle and then tap the View button. This will cause the Rail Vehicle dialog shown in Figure 64 to appear.



**Figure 64 - Rail Vehicle Data Dialog**

The Rail Vehicle Data dialog shows the tag information for the rail vehicle. To display the other data about the rail vehicle, tap the Menu button, and a pop-up menu will appear (see Figure 65).



**Figure 65 - Rail Vehicle Data Pop-up Menu**

By selecting one of the pop-up menu items, the user can view and change the system defined fields (see Paragraph 3.2), the user fields (see Paragraph 3.5), and the vehicle comments (see Paragraph 3.1) for the displayed vehicle.

## AI4100 Portable AEI Reader

### 6.1.5. Reverse Track Inventory

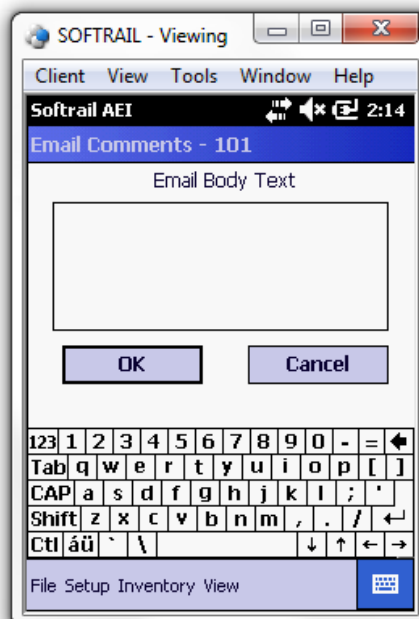
Occasionally track inventory is initially reported in the wrong direction (West to East instead of East to West). The Reverse List button in Figure 63 allows the user to easily correct this error by re-listing the track inventory in the opposite direction.

### 6.1.6. Email Comments

This function allows the user to enter comments about the track in the body text of an email if the message is being sent via an email.

To access this function, tap the Comments button in Figure 63, and the Email Comment dialog shown in Figure 66 will appear.

Data entered into this dialog will be saved and used in all sent messages until it is changed by the user.



**Figure 66 - Email Comments Dialog**

### 6.1.7. Send Track Inventory

Track inventory messages can be sent from the Track View dialog (see Figure 63) by tapping the Send button. This will cause the Send Track Inventory dialog shown in Figure 15 to be displayed (see Paragraph 2.6).



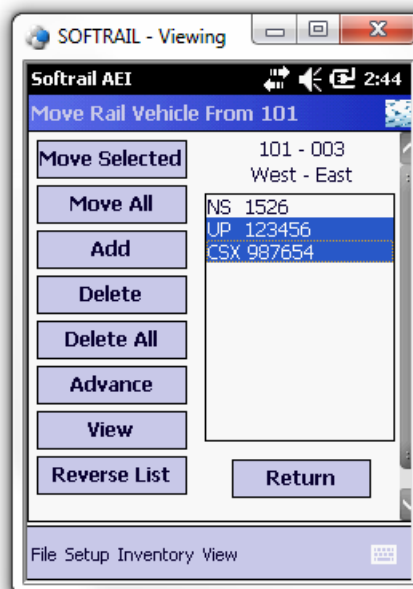
## AI4100 Portable AEI Reader

### 6.2. Move Track Inventory

To access the Move Track Inventory function, tap the Move Track Inventory menu item in the Inventory menu. The Track Select dialog displayed in Figure 62 will then appear.

The Move Track Inventory function is very similar to the View Track Inventory function with two exceptions. First, it allows rail vehicles to be moved from one track to another. Second, it allows multiple rail vehicles to be selected at the same time.

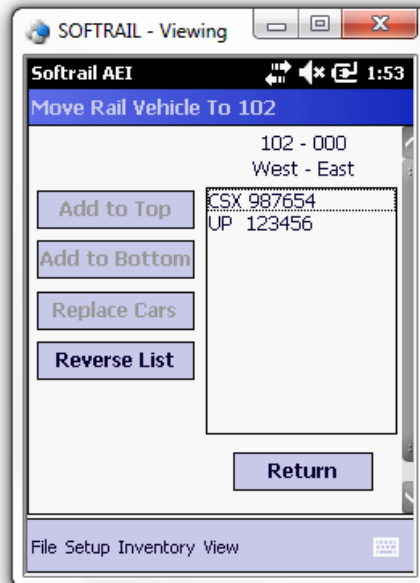
After a track is selected in the Track Select dialog, the Move Rail Vehicle From dialog shown in Figure 67 will appear.



**Figure 67 - Move Rail Vehicle From Dialog**

## 6.2.1. Move Selected Rail Vehicles to Another Track

To move rail vehicles from one track to another, select the rail vehicles you want to move by tapping on each one and then tap the Move Selected button. This will cause the Track Select dialog shown in Figure 62 to appear. Select the track to which you want to move the vehicles, and the Move Rail Vehicle To Track dialog shown in Figure 68 will appear.



**Figure 68 - Move Rail Vehicle To Track Dialog**

If there are already rail vehicles on the track to which the rail vehicles are being moved, you can add the moved rail vehicles to the top or bottom of the list of existing rail vehicles. You can also replace the existing rail vehicles with the moved vehicles.

If you replace the existing vehicles on the track, you will be asked if you want to move the existing vehicles to the Phantom Track (see Paragraph 6.1).

## 6.2.2. Move All Rail Vehicles to Another Track

To move all of the rail vehicles on a track to another track, tap the Move All button.

## 6.2.3. Other Move Rail Vehicle Functions

The other functions in the Move Rail Vehicle From dialog (see Figure 67) operate in the same manner as those in the Track View dialog (see Figure 63) with the exception of the Delete function. The Delete function in the Move Rail Vehicle From dialog allows multiple rail vehicles to be selected for deletion. The Track View dialog only allows one rail vehicle at a time to be selected for deletion.

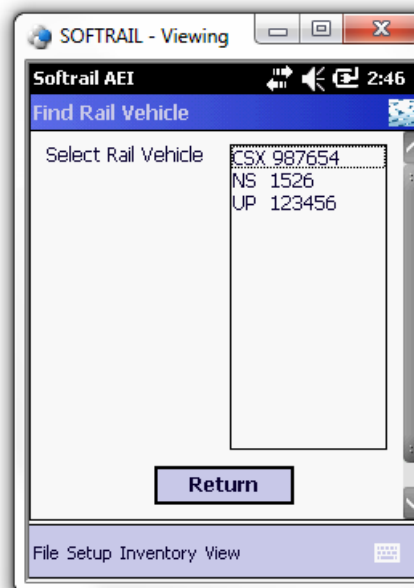
## AI4100 Portable AEI Reader

The following is a list of other functions in the Move Rail Vehicle From dialog and the paragraphs that describe them.

- Add - see Paragraph 6.1.1
- Delete - see Paragraph 6.1.2
- Delete All - see Paragraph 6.1.2
- Advance - see Paragraph 6.1.3
- View - see Paragraph 6.1.4
- Reverse List - see Paragraph 6.1.5

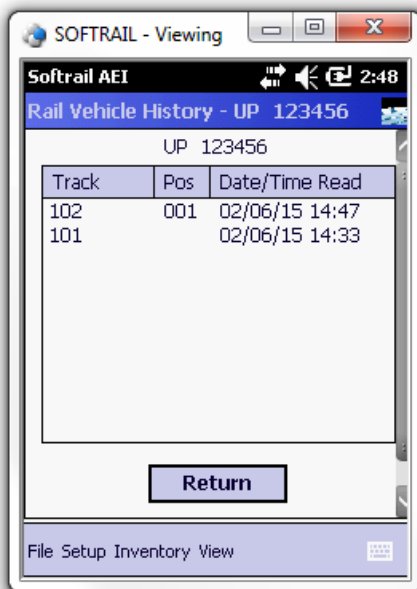
### 6.3. Find Rail Vehicle and Rail Vehicle Movement History

To access the Find Rail Vehicle function, tap the Find Rail Vehicle menu item in the Inventory menu. The Find Rail Vehicle dialog shown in Figure 69 will then appear.



**Figure 69 - Find Rail Vehicle Dialog**

All of the rail vehicles in the portable reader's database will be displayed in alphabetic order in the Find Rail Vehicle dialog. To find a particular vehicle, tap on the vehicle identification, and the Rail Vehicle History display shown in Figure 70 will appear.



**Figure 70 - Rail Vehicle History Display**

The Rail Vehicle History display shows the rail vehicle's current location and the time it was moved to the current location. It also shows the vehicle's previous locations (up to 10).

## 6.4. Delete All Track Inventory

To delete all of the rail vehicles in the portable reader's database, tap the Delete All Track Inventory menu item in the Inventory menu.

## 7. TRACK TAGS

Track tags are AEI tags that are programmed with track information. Their purpose is to eliminate the need to manually enter this information when taking track inventory.

Before reading AEI tags on rail vehicles, the operator would read the Track tag at his starting end of the track. After reading all of the rail vehicles tags, the operator would read the Track tag at the end of the track. When reading the second Track tag, the portable reader will end taking inventory for the track and either send the track consist automatically (see Paragraph 5.1 for setting up automatic transmission) or ask the operator if he wants to send the inventory.

Track tags contain the track name, the orientation of the track (North to South, South to North, etc), the tag sequence number, whether the track has track spot locations, and the orientation of the track spot locations.

There can be up to 99 Track tags along the side of the track. Each has a different sequence number. The Track tag closest to the start of the track (if the track orientation is North to South, then the North end of the track would be the starting point) would have the lowest number and the Track tag farthest from the start of the track would have the highest number.

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Track tags are standard AT5110 or AT5118 tags that are programmed in ASCII. The following table is the format of the Track tag:

Field	Starting Position	Field Size	Data
Tag Type Identifier	1	3	TRK
Track Orientation	4	1	N = North to South S = South to North W = West to East E = East to West
Sequence Number	5	2	Two-digits
Track Name	7	10	Up to 10 alpha/numeric characters
Track has Spot Location	17	1	Y = Has spot locations N = Does not have spot locations
Track Spot Orientation	18	1	N = North to South S = South to North W = West to East E = East to West

Examples:

TRKW99201      YW

TRKW01101      NW

## 8. SPOT TAGS

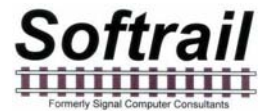
Spot tags are AEI tags that are programmed with track spot location information. Their purpose is to eliminate the need to manually enter information when taking track inventory.

Before reading Spot tags, the operator would read the Track tag at his starting end of the track.

Prior to reading the tag on the rail vehicle the Spot tag for the vehicle's location should be read. When the rail vehicle's tag is read, the vehicle's location will be determined by the information in the last Spot tag read.

Spot tags contain the track name associated with the spot location and the spot name.

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Spot tags are standard AT5110 or AT5118 tags that are programmed in ASCII. The following table is the format of the Track tag:

Field	Starting Position	Field Size	Data
Tag Type Identifier	1	4	SPOT
Track Name	5	10	Up to 10 alpha/numeric characters
Spot Name	15	5	Up to 5 alpha/numeric characters

Examples:

SPOT201      2A

SPOT201      2B

## 9. OEM FUNCTIONS

As an option the portable reader allows other companies to incorporate their own application software into the device. These companies are referred to as Original Equipment Manufacturers (OEMs).

To make it easier for OEM's to develop applications, the portable reader has several functions that allow OEM's to access tag data read by the portable reader and to send OEM-application generated data to other computer systems as a file transfer to an FTP server or as a file attachment to an email.

### 9.1. Accessing Tag Data

When the portable reader reads a tag or barcode it writes a record into a text file called "tag data.txt". This file is located in a folder designated by the user in the OEM Setup function (see Paragraph 5.16).

The Tag Data file is a text file that has an individual record for each tag read. Each record is terminated with a carriage return character (hex 0D) and line feed character (hex 0A). All fields within the record are separated by commas.

There are four types of records in the Tag Data file. These are:

- Rail vehicle tag
- Track tag
- Spot tag

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- Barcode data

Each of these records starts with a type designator in the first field of the record.

The following table shows the designator for each record type:

Type	Designator
Rail vehicle tag	RAIL
Track tag	TRK
Spot tag	SPOT
Barcode data	BAR

The following table is the layout of the record for the rail vehicle tag:

Field	Description	Values
1	Date and time when the tag was read	The field is in the following format MM/DD/YYYY(space)HH:MM  MM = month of year DD = day of month YYYY = year HH = hour MM = minute
2	Record Designator	RAIL
3	Data format code	Two digits  51 = standard rail vehicle identification format  (see AAR Specification S-918 for all codes)
4	Frame Marker	One digit  The number of the frame that was read. Dynamic tags can send multiple frames of data. Each frame is considered a separate tag read. Passive tags can only send one frame.

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5	Equipment group code	One to two digits 5 = locomotive 19 = railcar (see AAR Specification S-918 for all codes)
6	Vehicle initial (reporting marks)	Four alpha characters The field is filled with spaces if the vehicle initial is less than four characters
7	Vehicle number	One to six digits
8	Side indicator	Left or Right
9	Length in decimeters	1 to 4 digits
10	Number of axles	1 to 2 digits
11	Bearing code	1 digit from 0 to 7 (see AAR Specification S-918 for codes)
12	Platform code (for railcars only)	1 to 2 digits from 0 to 15 (see AAR Specification S-918 for codes)

The following are examples of RAIL records:

```
01/16/2006 10:58,RAIL,"51","1","5","NS ","1526","Left","183","4","1"
01/16/2006 10:58,RAIL,"51","1","19","UP ","123456","Left","161","4","1","0"
01/16/2006 10:58,RAIL,"51","1","19","CSX ","987654","Right","193","6","1","0"
01/16/2006 10:58,RAIL,"51","1","19","DEFX","112344","Left","185","4","1","0"
```



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The following table is the layout of the record for the Track tag:

Field	Description	Values
1	Date and time when the tag was read	The field is in the following format MM/DD/YYYY(space)HH:MM  MM = month of year DD = day of month YYYY = year HH = hour MM = minute
2	Record Designator	TRK
3	Track Name	Up to 10 alpha/numeric characters
4	Track Orientation	none North-South South-North West-East East-West
5	Sequence Number	A two-digit number that represents the tag's position from the starting end of the track.  The tag nearest the start would be 00 and the farthest 99  If the track is oriented North to South, the North most tag would be 00 and the South most 99
5	Track uses spot location	no spots spots
6	Spot Orientation	none North-South South-North West-East East-West

The following are examples of TRK records:

01/16/2006 10:58,TRK,"101","North-South","00 ","spots","North-South"  
01/16/2006 10:58,TRK,"301","North-South","99 ","no spots","none"

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The following table is the layout of the record for the Spot tag:

Field	Description	Values
1	Date and time when the tag was read	The field is in the following format MM/DD/YYYY(space)HH:MM MM = month of year DD = day of month YYYY = year HH = hour MM = minute
2	Record Designator	SPOT
3	Track Name	Up to 10 alpha/numeric characters
4	Spot	Up to 5 alpha/numeric characters

The following are examples of SPOT records:

01/16/2006 10:58,SPOT,"101","2A"

01/16/2006 10:58,SPOT,"101","2B"

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The following table is the layout of the record for the barcode read:

Field	Description	Values
1	Date and time when the tag was read	The field is in the following format MM/DD/YYYY(space)HH:MM  MM = month of year DD = day of month YYYY = year HH = hour MM = minute
2	Record Designator	BAR
3	Raw Barcode Data	12-digits
4	Field Name	Up to 20 alpha/numeric characters  Name of the field into which the barcode data will be entered
5	Data Translation	Up to 20 alpha/numeric characters  Text the portable reader translated the 5-digit field (digits 7 thru 11) of the barcode data into

The following are examples of BAR records:

```
01/16/2006 10:58,BAR,"09920000514","Maint1","empty"
01/16/2006 10:58,BAR,"025262888883","User1",""
```

### 9.2. Sending OEM Data

An OEM application can send data to other computers over the wireless LAN via the portable reader's software. OEM data can either be sent as a file attached to an email or in a file that is transferred to an FTP server.

To send data as an email file attachment, the OEM application writes a transmit request text file into the folder the user has specified as the Transmit Folder in the OEM Setup function (see Paragraph 5.15).

When the portable reader sees a new text file in this file folder it decodes the first record in this file to see if it is an email request or an FTP transfer request.

The transmit request file consists of a number of records which are each terminated with a carriage return character (hex 0D) and line feed character (hex 0A). All fields within the record are separated by commas.

The first record in the transmit request file is always the SETUP record, which specifies if it is an email request or an FTP transfer request.

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## 9.2.1. Email Transmit Request File

To send OEM data via email, information on the email outbound server must be entered in the Email Setup dialog (see Paragraph 5.3).

The email transmit request file consists of a number of record segments. These segments must be written in the following order:

```

SETUP
FROM
TO (up to 10 TO segments)
TO
TO
.
.
SUBJECT
BODY
FILE
(OEM Application Data)

```

The following is the layout of each segment record:

### SETUP Segment

Field	Description	Values
1	Segment code	SETUP
2	Transmit type	EMAIL

Example: SETUP,EMAIL

### FROM Segment

Field	Description	Values
1	Segment code	FROM
2	Reply email address	1 to 40 alpha/numeric characters

Example: FROM,tomlevine@signalcc.com

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### TO Segment

Field	Description	Values
1	Segment code	TO
2	To email address	1 to 40 alpha/numeric characters

Example: TO,sales@signalcc.com  
TO,aeitag@signalcc.com

Up to 10 TO segments

### SUBJECT Segment

Field	Description	Values
1	Segment code	SUBJECT
2	Subject text	1 to 40 alpha/numeric characters

Example: SUBJECT,Test Portable Reader Email

## BODY Segment

Field	Description	Values
1	Segment code	BODY
2	Email body text	1 to 800 alpha/numeric characters in quotations

Example: BODY,"This is a test email sent from a portable reader."

## FILE Segment

Field	Description	Values
1	Segment code	FILE
2	Name of the file that will be attached to the email and contains the OEM's application data	1 to 255 alpha/numeric characters

Example: FILE,emailtest.txt

After it writes the FILE segment, the OEM application writes its data into the transmit request file. The amount of user data that can be written is limited by the amount of free file data area in the portable reader's mobile computer. The portable reader software will write this data to a temporary file and attach it to the email. The name of the attached file is the file name specified in the FILE segment.

The following is an example of the email transmit request file:

```
SETUP,EMAIL
FROM,tomlevine@signalcc.com
TO,aei@signalcc.com
TO,sales@signalcc.com
TO,tomlevine@signalcc.com
SUBJECT,Test Email
BODY,"This is a test email."
FILE,emailtest.txt
Test data 1
Test data 2
Test data 3
```

## AI4100 Portable AEI Reader

### 9.2.2. FTP Transmit Request File

The FTP transmit request file consists of a SETUP segment and OEM application data. The information is written in the following order:

SETUP

(OEM Application Data)

The following is the layout of each segment record:

### SETUP Segment

Field	Description	Values
1	Segment code	SETUP
2	Transmit type	FTP
3	Server name or DEFAULT	0 to 40 alpha/numeric characters If "DEFAULT" is in this field, this is the last field in the segment and the portable reader will use the FTP server setting in the FTP Setup dialog (see 5.5) If no value is in this field, the portable reader will use the value in the IP address field to connect to the FTP server
4	IP address of the FTP server	IP address format xxx.xxx.xxx.xxx where XXX is any number between 0 and 255
5	Listening port	1 to 4 digits usually 21
6	Directory on the FTP server in which to store the file	1 to 40 alpha/numeric characters
7	User name	1 to 40 alpha/numeric characters
8	Password	1 to 40 alpha/numeric characters
9	File name of the file to be stored	1 to 255 alpha/numeric characters

Examples:

SETUP,FTP,ftp.signalcc.com,069.121.022.200,21,www,signal,sftsha12,ftptest.txt

SETUP,FTP,DEFAULT

## AI4100 Portable AEI Reader

After the SETUP segment, the OEM application writes its data into the transmit request file. The amount of user data that can be written is limited by the amount of free file data area in the portable reader's mobile computer. The portable reader software will write this data to a temporary file and transfer it to the FTP server. The name of the stored file is the file name specified in the SETUP segment.

The following is an example of the FTP transmit request file:

```
SETUP,FTP,ftp.signalcc.com,192.168.0.1,21,www.signalcc,7yg2512aa,ftptest.txt
Test data 1
Test data 2
Test data 3
```

### 9.2.3. OEM Transmit Request Status

The portable reader, when it reads an OEM transmit request file, checks the file for errors. If it finds an error it writes an error record into a file called "oem status log.txt" which is located in the same folder as the transmit request files. The following is the format of an error record:

Error,"transmit request file name","error description".

The following are examples of error records:

```
Error,"testftp.txt","no FTP file name in the first record of the OEM FTP transmit file"
Error,"testftp.txt","missing password in the first record of the OEM FTP transmit file"
Error,"testemail"," could not find carriage return line feed at the end of "FROM" record in the
OEM Email transmit file"
```

A record will also be written in the "oem status log.txt" file when the data in a transmit request file is successfully sent.

The following are the email and FTP formats for a sent status record:

```
SENT,mm/dd/yyyy hh:mm, EMAIL, "transmit request file name"
SENT,mm/dd/yyyy hh:mm, FTP, "transmit request file name"
```



## AI4100 Portable AEI Reader

### 10. ABOUT

To find information about the software version and the unit's serial number, tap the About menu item under the File menu, and the About display shown in Figure 71 will appear.



**Figure 71 - About Display**

### 11. MAINTENANCE AND COMMUNICATION LOGS

To help find problems with the portable reader, the portable reader maintains two logs. These are the maintenance log and the communications log.

#### 11.1. Maintenance Log

The maintenance log is located in a text file called "maint log.txt" in the Program Files\AI4100 folder. It contains information about when various events occurred and if internal problems were detected.

To view the maintenance log tap the Maintenance Log menu item under the View menu.

The following is an example of information contained in this log:

```
12/29/2005 12:48 Start of program
12/29/2005 12:48 TCP/IP Initialized Name = "Tom_Levine " IP = "127.0.0.1"
12/29/2005 12:48 Request to turn off wireless radio
12/29/2005 12:48 Could not open comm log file for clean up
12/29/2005 12:49 Program closed
12/29/2005 16:30 Start of program
12/29/2005 16:30 TCP/IP Initialized Name = "Tom_Levine" IP = "127.0.0.1"
12/29/2005 16:31 Program closed
01/13/2006 10:14 Start of program
01/13/2006 10:14 TCP/IP Initialized Name = "Tom_Levine" IP = "192.168.55.101"
01/13/2006 10:14 0 rail vehicle(s) assigned to tracks were deleted, 4 tag record(s) not assigned to tracks were deleted.
```

## AI4100 Portable AEI Reader

01/16/2006 12:01 Manual clear inventory request

To help find problems, Softrail may need to obtain a copy of the maintenance log. This can be easily sent via email by tapping on the Send Maintenance Log to Softrail menu item under the File menu. For this file to be sent via email the portable reader's mobile computer must have a connection to the internet. It is not necessary to enter information in the Email Setup dialog (see Paragraph 5.3) for the maintenance log to be sent.

### 11.2. Communications Log

The communications log is located in a text file called "comm log.txt" in the Program Files\AI4100 folder. It contains information about communications between the portable reader's mobile computer and other devices including the internal AEI RF reader. The internal RF reader is connected to the mobile computer's serial communications port.

To view the communications log, tap the Communications Log menu item under the View menu.

The following is an example of information contained in this log:

```
12/29/2005 12:49 R (COM1) Received "**P=H@!?8MQD    S"  
12/29/2005 12:49 R (COM1) Received "FXO3!XD H1D    S"  
12/29/2005 12:49 R (COM1) Received "FC2:?$@:P2D    S"  
12/29/2005 12:49 R (COM1) Received "GCUH!MM@N1D    S"
```

To help find problems, Softrail may need to obtain a copy of the communications log. This can be easily sent via email by tapping on the Send Communications Log to Softrail menu item under the File menu. For this file to be sent via email the portable reader's mobile computer must have a connection to the internet. It is not necessary to enter information in the Email Setup dialog (see Paragraph 5.3) for the communications log to be sent.

# AI4100 Portable AEI Reader

## 12. FILE MAINTENANCE

The portable reader software generates a number of files and continuously adds records to these files. Periodically, records in these files must be deleted so that the portable reader does not run out of storage area.

The following table describes the rules for deleting records from the files:

File Name	Record Deletion Rules
Maintenance Log "maint log.txt"	Does not allow file to exceed 200,000 bytes. Deletes oldest records to maintain this size.
Communications Log "comm log.txt"	Does not allow file to exceed 200,000 bytes. Deletes oldest records to maintain this size.
OEM Tag Data "tag data.txt"	Does not allow file to exceed 20,000 bytes. Deletes oldest records to maintain this size.
OEM Status Log "oem status.txt"	Does not allow file to exceed 20,000 bytes. Deletes oldest records to maintain this size.
Rail Car Data Base	Deletes all tag records for vehicles that have not been assigned to a track and were last read over 3 days ago.  Deletes all tag records for vehicles that have been assigned to a track and were last read or moved over 30 days ago.

# AI4100 Portable AEI Reader

## 13. TEXT FILE FORMAT

The portable reader can send track inventory information in two types of comma delimited text file formats.

These are referred to as EDI and Excel text file formats.

The EDI format is a comma delimited text file. This format uses Electronic Data Interchange (EDI) type records. This file has many different types of records and is generally used for computer-to-computer communications.

The second format is also a comma delimited text file. We refer to it as the Excel file format since it was designed so that files using this format can be easily imported into most commercial word processing, spreadsheet and database programs.

The following describes these formats:

### 13.1. EDI Text File Format

The EDI text file consists of a number of segment records, which are each terminated with a carriage return character (hex 0D) and line feed character (hex 0A).

There are seven segment record types. The following defines the segment types and their associated codes:

Segment Code	Maximum Number in File	Description
START	1	Message header segment
TRACK	1	Track segment - contains the track name and the orientation of the vehicle inventory
USER	1	User segment - contains the names of user fields
RAIL1	200	Rail 1 segment – contains time on the track, the rail vehicle's tag data and system defined fields
RAIL2	200	Rail 2 segment – contains data in the user fields
RAIL3	200	Rail 3 segment (optional) – contains user comments
END	1	Message trailer segment

A segment code is at the beginning of each segment. A comma follows the segment code and commas separate the remaining fields in the segment, which are enclosed in quotes. The following is the general layout of all types of segments:

## AI4100 Portable AEI Reader

**Segment code,"field 1","field 2","field 3",.....,<carriage return character><line feed character>**

The segments are written in the following order:

START  
TRACK  
USER  
RAIL1  
RAIL2  
RAIL3 (optional)  
RAIL4 (optional)  
RAIL1  
RAIL2  
RAIL3 (optional)  
RAIL4 (optional)  
.  
.  
END

## AI4100 Portable AEI Reader

The following is the layout of each segment record:

### START Segment

Field Number	Data Name	Data Format	Description
ST1	Segment Code	START	Segment code
ST2	Version	Numeric 4 digits	Version number of the file format
ST3	Date/Time	MM/DD/YYYY<space> HH:MM	Date and time the file was created MM = month DD = day of month YYYY = year HH = hour SS = second
ST4	Sequence Number	Numeric 4 digits	The sequence number of the file from 0 to 9999. This sequence number is incremented each time a new file is created. When it reached 10,000, it is reset to 0

Example: START,"0001","12/19/2005 12:11","0021"

### TRACK Segment

Field Number	Data Name	Data Format	Description
TRK1	Segment Code	TRACK	Segment code
TRK2	Track	Alpha/Numeric 1 to 10 characters	Track where the rail vehicles are located
TRK3	Orientation	NORTH SOUTH EAST WEST	The end of the track where the rail inventory begins

Example: TRACK,"301","WEST"

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## USER Segment

Field Number	Data Name	Data Format	Description
USR1	Segment Code	USER	Segment code
USR2	Field Name 1	Alpha/Numeric 1 to 20 characters	Name of user field 1
USR3	Field Name 2	Alpha/Numeric 1 to 20 characters	Name of user field 2
USR4	Field Name 3	Alpha/Numeric 1 to 20 characters	Name of user field 3
USR5	Field Name 4	Alpha/Numeric 1 to 20 characters	Name of user field 4
USR6	Field Name 5	Alpha/Numeric 1 to 20 characters	Name of user field 5
USR7	Field Name 6	Alpha/Numeric 1 to 20 characters	Name of user field 6
USR8	Field Name 7	Alpha/Numeric 1 to 20 characters	Name of user field 7

Example: USER,"commodity","not assigned 2","not assigned 3","not assigned 4","not assigned 5","not assigned 6","not assigned 7"

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## RAIL 1 Segment

Field Number	Data Name	Data Format	Description
RAIL101	Segment Code	RAIL1	Segment code
RAIL102	Position	Numeric 1 to 3 digits 1 to 200	Position of the vehicle from the beginning of the track
RAIL103	Equipment Code	Numeric 1 to 2 digits	Type of vehicle 5 = locomotive 19 = railcar
RAIL104	Vehicle Initial	Alpha 4 characters	Vehicle initial (reporting marks) The field is filled with spaces if the vehicle initial is less than four characters
RAIL105	Vehicle Number	Numeric 1 to 6 digits	Vehicle number
RAIL106	Date/Time	MM/DD/YYYY<space> HH:MM:SS	Date and time the vehicle was moved to the track MM = month DD = day of month YYYY = year HH = hour MM = minute SS = second
RAIL107	Track Spot	Alpha/Numeric 0 to 5	Spot name or "None" if spot locations are not used
RAIL108	Spot Position	Numeric 1 to 3 digits	Spot position on the track starting with one.
RAIL109	Manual Entry	Yes No	"Yes" indicates that the vehicle's identification was entered manually and "No" via an AEI tag read.
RAIL110	Tag Side	Left Right	Side indicator reported by AEI tag
RAIL111	Tag Length	Numeric 1 to 4 digits	Vehicle's length reported by AEI tag in decimeters
RAIL112	Tag Axle	Numeric 2 digits	Vehicle's axle count reported by AEI tag
RAIL113	Tag Bearing Code	Numeric 1 digit	Vehicle's bearing code reported by AEI tag



## AI4100 Portable AEI Reader

RAIL114	Tag Platform Code	Numeric 1 to digits or blank if locomotive	Platform code reported by AEI tag
RAIL115	Maintenance Field 1	Alpha/Numeric 0 to 20 characters	Maintenance field 1
RAIL116	Maintenance Field 2	Alpha/Numeric 0 to 20 characters	Maintenance field 2
RAIL117	Status Field	Alpha/Numeric 0 to 20 characters	Status field
RAIL118	Consist Field	Alpha/Numeric 0 to 20 characters	Consist field

Example:

RAIL1,"1","5","NS ","1526","01/17/2006 10:41:54","None","1","No","Left","183",  
"4","1","","","","","","",""

## RAIL 2 Segment

Field Number	Data Name	Data Format	Description
RAIL201	Segment Code	RAIL2	Segment code
RAIL202	Position	Numeric 1 to 3 digits 1 to 200	Position of the vehicle from the beginning of the track
RAIL203	Equipment Code	Numeric 1 to 2 digits	Type of vehicle 5 = locomotive 19 = railcar
RAIL204	Vehicle Initial	Alpha 4 characters	Vehicle initial (reporting marks) The field is filled with spaces if the vehicle initial is less than four characters
RAIL205	Vehicle Number	Numeric 1 to 6 digits	Vehicle number
RAIL206	User Field 1	Alpha/Numeric 0 to 20 characters	User field 1
RAIL207	User Field 2	Alpha/Numeric 0 to 20 characters	User field 2
RAIL208	User Field 3	Alpha/Numeric 0 to 20 characters	User field 3

## AI4100 Portable AEI Reader

RAIL209	User Field 4	Alpha/Numeric 0 to 20 characters	User field 4
RAIL210	User Field 5	Alpha/Numeric 0 to 20 characters	User field 5
RAIL211	User Field 6	Alpha/Numeric 0 to 20 characters	User field 6
RAIL212	User Field 7	Alpha/Numeric 0 to 20 characters	User field 7

Example: RAIL2,"1","5","NS ","1526","coal","","","","",""

## AI4100 Portable AEI Reader

### RAIL 3 Segment

Field Number	Data Name	Data Format	Description
RAIL301	Segment Code	RAIL3	Segment code
RAIL302	Position	Numeric 1 to 3 digits 1 to 200	Position of the vehicle from beginning of the track
RAIL303	Equipment Code	Numeric 1 to 2 digits	Type of vehicle 5 = locomotive 19 = railcar
RAIL304	Vehicle Initial	Alpha 4 characters	Vehicle initial (reporting marks) The field is filled with spaces if the vehicle initial is less than four characters
RAIL305	Vehicle Number	Numeric 1 to 6 digits	Vehicle number
RAIL306	Comments Field	Alpha/Numeric 0 to 200 characters	Vehicle comments field

Example: RAIL3,"1","5","NS ","1526","Broken glad hand"

### RAIL 4 Segment

Field Number	Data Name	Data Format	Description
RAIL401	Segment Code	RAIL4	Segment code
RAIL402	Position	Numeric 1 to 3 digits 1 to 200	Position of the vehicle from the beginning of the track
RAIL403	Equipment Code	Numeric 1 to 2 digits	Type of vehicle 5 = locomotive 19 = railcar
RAIL404	Vehicle Initial	Alpha 4 characters	Vehicle initial (reporting marks) The field is filled with spaces if the vehicle initial is less than four characters
RAIL405	Vehicle Number	Numeric 1 to 6 digits	Vehicle number

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
---	---	---	---	---	---	---	---	---	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	-----

Example: END,"11"

## AI4100 Portable AEI Reader

The following is an example of a track inventory text file:

```
START,"0001","01/17/2006 13:21:55","0002"
TRACK,"201","WEST"
USER,"commodity","not assigned 2","not assigned 3","not assigned 4","not assigned 5","not assigned 6","not assigned 7"
RAIL1,"1","5","NS ","1526","01/17/2006 10:41:54","None","1","Left","183","4","1","","","","",""
RAIL2,"1","5","NS ","1526","coal","","","","",""
RAIL3,"1","5","NS ","1526","broken glad hand"
RAIL1,"2","19","UP ","123456","01/17/2006 10:42:06","None","2","Left","161","","4","1","0","","",""
RAIL2,"2","19","UP ","123456","","","",""
RAIL1,"3","19","CSX ","987654","01/17/2006 10:42:08","None","3","Right","193","","6","1","0","","",""
RAIL2,"3","19","CSX ","987654","timber","","",""
RAIL1,"4","19","DEFX","112344","01/17/2006 10:42:10","None","1","Left","185","","4","1","0","","",""
RAIL2,"4","19","DEFX","112344","","",""
END,"12"
```

### 13.2. Excel Text File

The Excel text file consists of a header record and data records. The first record in the file is the header record, which gives a description of data in each field of the data records.

Each record is terminated with a carriage return character (hex 0D) and line feed character (hex 0A).

The following is an example of the header record:

```
"Vehicle ID","Track","Position","Type","Time","Manual","Status","Consist","Maint 1",
"Maint 2","User 1","User 2","User 3","User 4","User 5","User 6","User 7"
```

The "User 1" through "User 7" fields will contain the field names that were entered in the User Fields dialog (see Paragraph 3.5).

## Data Record

Field Number	Data Name	Data Format	Description
1	Vehicle ID	Alpha 4 characters Numeric 1 to 6 digits AAAANNNNNN	Vehicle initial and number  The initial is filled with spaces if the vehicle initial is less than four characters
2	Track	Alpha/Numeric 1 to 10 characters	Name of the track on which the vehicle is located

## AI4100 Portable AEI Reader

3	Position on track	Alpha 1 character Dash Numeric 3 digits A - NNN	The first character designates the end of the track on which the first position is located.  N = North S = South W = West E = East  The next 1 to 3 digits indicate the position of the vehicle on the track
4	Type of Vehicle	Diesel Railcar	Type of rail vehicle
5	Date/Time	MM/DD/YYYY<space> HH:MM:SS	Date and time the vehicle was moved to the track MM = month DD = day of month YYYY = year HH = hour MM = minute SS = second
6	Manual	Yes No	Indicates if the vehicle was entered manually into the portable reader (Yes) or read from an AEI tag (no)
7	Status	Alpha/Numeric 0 to 20 characters	Status field
8	Consist	Alpha/Numeric 0 to 20 characters	Consist field
9	Maintenance Field 1	Alpha/Numeric 0 to 20 characters	Maintenance field 1
10	Maintenance Field 2	Alpha/Numeric 0 to 20 characters	Maintenance field 2
11	User 1	Alpha/Numeric 0 to 20 characters	User field 1
12	User 2	Alpha/Numeric 0 to 20 characters	User field 2
13	User 3	Alpha/Numeric 0 to 20 characters	User field 3
14	User 4	Alpha/Numeric 0 to 20 characters	User field 4

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15	User 5	Alpha/Numeric 0 to 20 characters	User field 5
16	User 6	Alpha/Numeric 0 to 20 characters	User field 6
17	User 7	Alpha/Numeric 0 to 20 characters	User field 7
18	User 8	Alpha/Numeric 0 to 20 characters	User field 8
19	Serial Number 1	Alpha/Numeric 0 to 20 characters	Serial Number 1
20	Serial Number 2	Alpha/Numeric 0 to 20 characters	Serial Number 2
21 thru 57	Serial Number 3 thru 39	Alpha/Numeric 0 to 20 characters	Serial Number 3 thru 39
58	Serial Number 40	Alpha/Numeric 0 to 20 characters	Serial Number 40

Example:

"NS 1526","101","W - 004","Railcar","01/17/2008 10:41:54","No","empty","",  
"bad glad hand","","","","","","","","","981726252","15124261","161712"" "" ""

[illegible]

## 14. TCP/IP COMMUNICATIONS

The AI4100 Portable AEI Reader communicates to Softrail's AEI Rail and Road Manager program using TCP/IP and a unique protocol. Other developers can use this protocol to write software to communicate with the AI4100 Portable AEI Reader without going through the AEI Rail and Road Manager program.

The AEI Rail and Road Manager program acts as a server and listens for connections from portable readers, which act as clients. To make this connection, the IP address and listening port of the computer hosting the AEI Rail and Road Manager program must be entered into each portable reader. This information is entered into the portable reader via the AEI RR TCP/IP Setup dialog. Paragraph 5.2 describes this dialog.

When a command is issued for the portable reader to send track inventory data to the AEI Rail and Road Manager program, the portable reader attempts to make a connection with the AEI Rail and Road Manager program.

## AI4100 Portable AEI Reader

Once a connection is made, the portable reader sends a number of record segments to the AEI Rail and Road Manager program. Each record segment is terminated with a carriage return character (hex 0D) and line feed character (hex 0A). Commas separate the fields within the record segment. The first record segment is always the Portable segment, which identifies the portable reader. The following is a layout of this segment:

### Portable Segment

Field Number	Data Name	Data Format	Description
P1	Segment Code	PORTABLE	Segment code
P2	Portable Reader Identifier	Up to 10 alpha/numeric characters	Identifier the user entered into the portable reader's mobile computer (see Paragraph 5.12)
P3	Portable Reader's Mobile Computer Serial Number	Up to 20 alpha/numeric characters	Serial number of the portable reader's mobile computer

Example: PORTABLE,"Yard 1","2CK55005TR"

When the AEI Rail and Road Manager program receives this segment it will send an acknowledge message which consists of a three character response "ACK" followed by a carriage return and a line feed character.

The portable reader will then send a track data file in a single data stream. The layout of this data can be found in Paragraph 13.1 (Text File Format).



## AI4100 Portable AEI Reader

A number of track data files can be sent in the same connection. When the last track data field is sent, the portable reader will send a Finished record segment. The following is the layout of the Finished segment:

### Finished Segment

Field Number	Data Name	Data Format	Description
F1	Segment Code	FIN	Segment code
F2	Number of bytes sent	Up to 10 numeric characters	The number of bytes sent in the track data files. The Portable and Finished record segments are not included. Carriage return and line feed characters in the track data files are included.

Example: FIN,"677"

When the AEI Rail and Road Manager program receives the Finished segment it will send an acknowledge message which consists of a three character response "ACK" followed by a carriage return and a line feed character.

Until the acknowledge message is received the portable reader will try to send the data again. When the acknowledge message is received, it will disconnect from the server.

## AI4100 Portable AEI Reader

The following is a copy of the AEI Rail and Road Manager's communication log, which shows an example of the data transfer from the portable reader to the AEI Rail and Road Manager program:

```
01/14/2009 10:53:23 (TCP/IP) "Listening" "Connection made to Listening Socket-"0" IP-"127.0.0.1" Port-"2101""
01/14/2009 10:53:23 (TCP/IP) "unknown" "R-- PORTABLE,"Yard 1","2CK6470L1D""
01/14/2009 10:53:23 (TCP/IP) "unknown" "T-- ACK"
01/14/2009 10:53:23 (TCP/IP) "unknown" "R-- START,"0001","05/09/2005 12:02:43","0019""
01/14/2009 10:53:23 (TCP/IP) "unknown" "R-- TRACK,"101","WEST","NOSPOT""
01/14/2009 10:53:23 (TCP/IP) "unknown" "R-- USER,"User 1","Ok Load","Reason No","AntiFreeze","Dust","Loaded","Destination""
01/14/2009 10:53:23 (TCP/IP) "unknown" "R-- RAIL1,"1","19","CSX ","987654","05/09/2005
12:02:02","None","0","No","Right","193","6","1","0","","","""
01/14/2009 10:53:23 (TCP/IP) "unknown" "R-- RAIL2,"1","19","CSX ","987654","","Yes","","No","No","No","""
01/14/2009 10:53:24 (TCP/IP) "unknown" "R-- RAIL1,"2","5","NS ","001526","05/09/2005
12:02:12","None","0","No","Left","183","4","1","","","","""
01/14/2009 10:53:24 (TCP/IP) "unknown" "R-- RAIL2,"2","5","NS ","001526","","Yes","","No","No","No","""
01/14/2009 10:53:24 (TCP/IP) "unknown" "R-- RAIL1,"3","19","UP ","002289","05/09/2005
12:02:18","None","0","No","Right","174","4","1","0","","","""
01/14/2009 10:53:24 (TCP/IP) "unknown" "R-- RAIL2,"3","19","UP ","002289","","Yes","","No","No","No","""
01/14/2009 10:53:24 (TCP/IP) "unknown" "R-- END,"9""
01/14/2009 10:53:24 (TCP/IP) "unknown" "R-- FIN,"00673""
01/14/2009 10:53:24 (TCP/IP) "unknown" "T--ACK"
01/14/2009 10:53:24 (TCP/IP) "unknown" "Close of S4 socket 0"
```

The portable reader's mobile computer also contains a communication log (see Paragraph 11.2).

## 15. TECHNICAL SUPPORT AND UPDATES

Periodically Softrail issues maintenance releases and new versions of the software in the AI4100 Portable Reader. Maintenance releases are free and correct problems found with the program and/or provide minor enhancements to the program. Before contacting us with problems we suggest you contact your sales representative and review the issues with him and/or check our web page at [www.aeitag.com](http://www.aeitag.com) to insure that you have the latest maintenance release of the program.

Technical support is free for the first one year after purchase, but is limited to two hours of support for each portable reader that is purchased. Time is charged in blocks of 15 minutes.

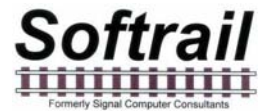
A maintenance agreement can be purchased to extend the period of technical support or add additional hours.

For technical support or more information on the maintenance agreement, contact Softrail at:

**Softrail, Inc.**  
1098 Venetia Road  
Eighty-Four, PA 15330

Tel. 888 872-4612 (toll free US and Canada only) or 724 942-1473  
Fax. 724 942-1480  
E-mail [aei@signalcc.com](mailto:aei@signalcc.com)  
Web Page [www.aeitag.com](http://www.aeitag.com)

# AI4100 Portable AEI Reader



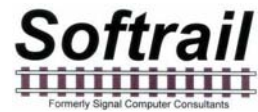
## 16. SYSTEM SPECIFICATIONS

Maximum Number of Vehicles in System	5,000
Maximum Number of Vehicles per Track	200
Maximum Number of Tracks	100
Maximum Number of Messages Pending Transmission	200
Maximum Character Size of Track Name	10
Maximum Number of User Fields	7
Maximum Character Size of User and System Defined Fields	20
Maximum Vehicle Comments Field's Character Size per Vehicle	200
Maximum Vehicle Comments Field's Character Size per System	50,000

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